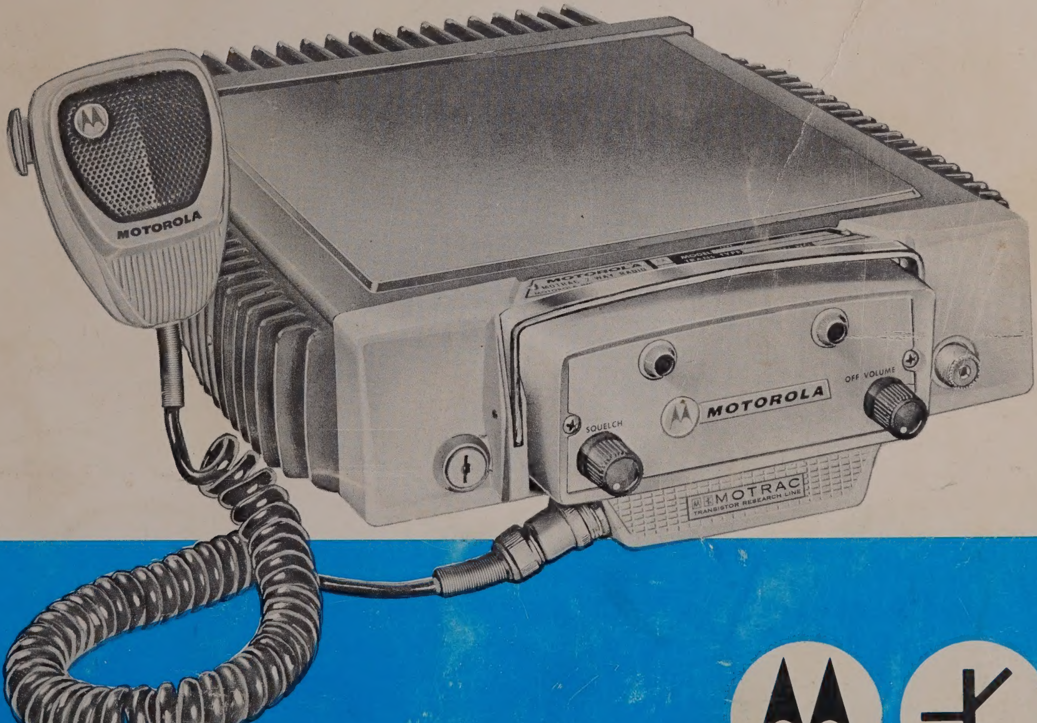
MOTOROLA INC., COMMUNICATIONS DIVISION • **INSTRUCTION MANUAL**

MOTRAC®

MOBILE FM TWO-WAY RADIO

25-54 MC   30 W, 50 W & 100 W RF POWER


MOTOROLA
MOTOROLA
SQUELCH
OFF VOLUME
MOTOROLA
MOTRAC
TRANSISTOR RESEARCH LINE

PRINTED IN U.S.A.

68P81014A05-O

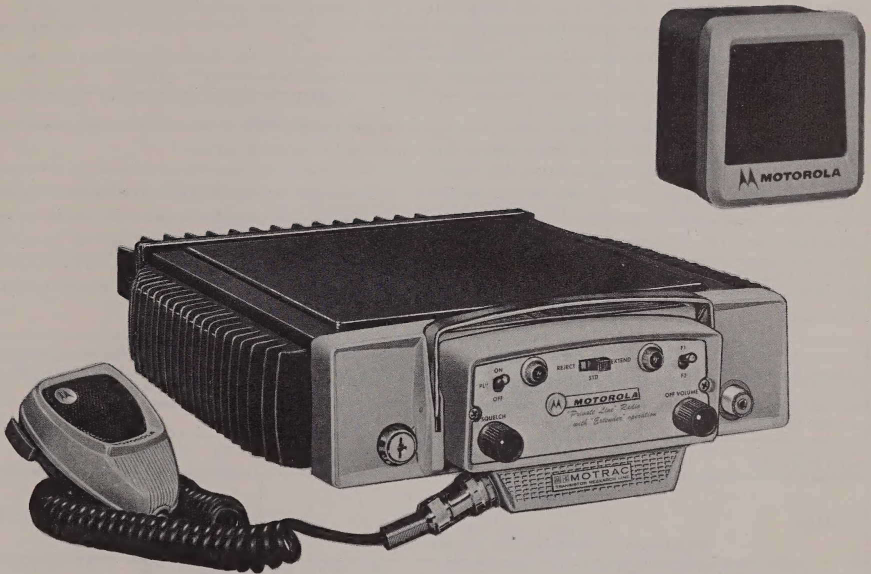
MOTOROLA

MOTRAC

MOBILE FM TWO-WAY RADIO

25-54 MC

AEPD-6386-A (MC6759)


MOTOROLA
ON
PL
OFF
REJECT
STD
EXTEND
F1
F2
MOTOROLA
"Private Line" Radio
with "Extender" operation
SQUELCH
OFF VOLUME
MOTRAC
TRANSISTOR RESEARCH LINE

MOTOROLA INC.
COMMUNICATIONS DIVISION
Engineering Publications
4501 W. Augusta Blvd.
Chicago 51, Illinois

Copyright 1962 by Motorola, Inc.
Printed in U.S.A.
11/13/62-UM

68P81014A05
Issue - O

SPECIFICATIONS

GENERAL

MODELS		U41HHT Series (30 watts)		U51HHT Series (50 watts)		U71HHT Series (100 watts)
*MAXIMUM BATTERY DRAIN	STANDBY (xmtr filaments off)	6.6 v d-c 2.1 amps	13.8 v d-c 0.35 amp	6.6 v d-c 2.1 amps	13.8 v d-c 0.35 amp	13.8 v d-c 0.35 amp
	RECEIVE (xmtr filaments on)	6.6 v d-c 6.1 amps	13.8 v d-c 2.2 amps	6.6 v d-c 6.1 amps	13.8 v d-c 2.2 amps	13.8 v d-c 2.8 amps
	TRANSMIT	6.4 v d-c 26 amps	13.6 v d-c 12 amps	6.4 v d-c 35.5 amps	13.6 v d-c 14.3 amps	13.4 v d-c 24.5 amps
*add average drain per crystal oven at 25°C: 0.18 amp on 12 v d-c operation; 0.55 amp on 6 v d-c operation						
FREQUENCY		25-50 mc ("Extender" and dual squelch models); 25-54 mc (carrier squelch models)				
METERING		A single scale, 0-50 microampere meter or Motorola portable test set can be used to measure all circuits essential to tuning and checking.				
DIMENSIONS		Dash mount: 4" high x 13-3/8" wide x 18-3/4" long overall (30 & 50 w); 19-1/2" long overall (100 w) Trunk mount: 3-1/4" high x 13-3/8" wide x 17-1/2" long overall (30 & 50 w); 18-1/4" long overall (100 w)				
WEIGHT		approximately 30 lbs (shipping weight including accessories: approximately 50 lbs)				

"H" TRANSMITTER

CHASSIS	TTB1000 & TTB1060 Series	
RF POWER OUTPUT	30, 50 or 100 watts, depending upon radio set model.	
OUTPUT IMPEDANCE	50 ohms	
SPURIOUS & HARMONIC EMISSIONS	spurious and harmonics more than 85 db below carrier.	
FREQUENCY STABILITY	oven type crystal unit maintains carrier within ±.0005% of assigned center frequency from -30°C to +60°C ambient (+25°C reference)	
MODULATION	20F3: ±5 kc for 100% at 1000 cps or 40F3: ±15 kc for 100% at 1000 cps	
AUDIO SENSITIVITY	.165 volt ±3 db for 2/3 maximum deviation at 1000 cps	
FM NOISE	-50 db below ±3.3 kc deviation at 1000 cps -56 db below ±10 kc deviation at 1000 cps	
AUDIO RESPONSE	+1, -6 db of 6 db/octave pre-emphasis characteristic from 300 to 3000 cps (dual squelch)	+1, -3 db of 6 db/octave pre-emphasis characteristic from 300 to 3000 cps (carrier squelch)
AUDIO DISTORTION	less than 10% at 1000 cps; ±3.3 kc deviation	

"H" RECEIVER

CHASSIS	TRB1120BB, BD, BF, BH TRB1130BB, BD, BF, BH TRB1140BB, BD, BF, BH TRB1150BB, BD, BF, BH	TRB1120BA, BC TRB1130BA, BC
CHANNEL SPACING	20 kc	40 kc
SELECTIVITY	-100 db at ±15 kc	-100 db at ±32 kc
MODULATION ACCEPTANCE	±5 kc	±15 kc
SENSITIVITY	less than 0.40 microvolt for 20 db quieting; 50 ohms r-f input impedance	
FREQUENCY STABILITY	oven type crystal maintains oscillator frequency within ±.0005% of reference frequency from -30°C to +60°C ambient (+25°C reference)	
SPURIOUS & IMAGE REJECTION	more than 100 db	
SQUELCH	Carrier Squelch; noise compensated type, adjustable sensitivity, threshold sensitivity of 0.15 microvolt (Patent No. 2343115, other patents pending). Dual squelch; also includes a tone-operated squelch circuit with a fixed sensitivity of 0.15 microvolt (Patent No. 2688059)	
AUDIO OUTPUT	5 watts to a 3 ohm load measured at the receiver output at less than 10% distortion	
AUDIO RESPONSE	+1, -8 db of 6 db/octave de-emphasis characteristic from 300 to 3000 cps	

SPECIFICATIONS SUBJECT TO CHANGE WITHOUT NOTICE

FCC LICENSE DESIGNATION:	CC1027 for 30 watts output CC1028 for 50 watts output CC1033 for 100 watts output

FOREWORD

SCOPE OF INSTRUCTION MANUAL

This manual offers descriptive and service information for the "Motrac" Radio Sets described in it. A SERVICE DIAGRAMS booklet is also included with the radio set which includes the schematic, parts lists, and printed circuit board details.

NOMENCLATURE

Motorola "Motrac" radio equipment is packaged as a radio set plus accessories. The radio set is specifically identified by the model number on the nameplate.

NOTE

Be sure to use the entire model number when making inquiries about your equipment.

The accessories are identified by an accessory group number which includes the other items essential to completing the radio installation such as; antenna, cables, etc. Use this number when referring to a specific group of accessories.

Identifiers have been assigned to chassis and kits. Use these identifiers when requesting information or ordering replacements.

Radio set and accessory group charts are located in the front of this manual.

PRODUCTION CHANGES

When production and engineering changes are incorporated into the equipment, a revision numeral is assigned to the chassis or kit affected.

Typical Example:
A Model TTD1251AA Transmitter becomes
TTD1251AA-1 with the first revision.

This chassis number complete with revision numeral if any, is stamped on the chassis at the time of production. The revision numeral becomes an integral part of the chassis identifier.

A schematic diagram number complete with its issue letter is also stamped on each chassis. This establishes direct correlation between the chassis and its schematic. The schematic issue is advanced each time a change occurs in the chassis.

INSTRUCTION MANUAL REVISIONS

Changes which occur after an instruction manual is printed are described in the Instruction Manual Revisions. These bulletins give the reader complete information on the change including pertinent parts listing data.

NATIONAL SERVICE ORGANIZATION

Motorola provides a nation-wide service organization. Through its maintenance and installation program Motorola makes available the finest service to those desiring reliable continuous communications on a contract basis.

The largest service organization specializing in mobile communications is Motorola's National Service Organization. Over 800 strategically located, adequately staffed and trained, independently owned and operated stations, manned with several thousand FCC licensed personnel constitute the sub-contracting force.

national
MOTOROLA
RADIO COMMUNICATIONS
service

The administrative forces of area and district service managers and district service representatives are in the direct employ of Motorola.

For your contract service requirements, please contact your local Motorola representative or write to:

National Service Manager
Motorola Communications Division
4501 W. Augusta Blvd., Chicago 51, Illinois

REPLACEMENT PARTS ORDERING

Motorola maintains parts and service depots and authorized service stations strategically located throughout the country. These facilities are fully equipped to give the finest service.

When ordering replacement parts, the complete number identification of the item must be used whether it be a component, kit or complete chassis. This will fix proper identification and insure receipt of the desired item. Complete number identification should also be used when requesting equipment information.

Crystal orders should specify crystal type number, crystal frequency, carrier frequency and the chassis model number in which the crystal is to be used.

Orders for "Vibrasender" and "Vibrasponder" resonant reeds should specify the type number and frequency and should identify the owner and operator of the communications system in which these items are to be used.

CAREFUL USE OF THE INSTRUCTION MANUAL AND THE MANY SUGGESTIONS CONTAINED IN IT WILL FURTHER INSURE PROPERLY INSTALLED AND MAINTAINED RADIO EQUIPMENT.

THE EQUIPMENT DESCRIBED IN THIS MANUAL IS MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING MOTOROLA U. S. PATENTS:

RE-24,110
RE-24,815
2,404,359
2,439,408
2,439,412
2,472,021
2,524,300
2,524,534
2,547,023
2,547,025
2,547,027
2,566,759
2,583,032
2,602,842
2,608,648
2,608,649
2,626,384
2,637,782
2,650,333
2,662,942
2,688,059
2,691,094
2,691,560
2,699,425
2,705,281
2,731,555
2,738,466
2,740,891
2,743,144
2,743,361
2,750,451
2,759,052
2,759,103
2,770,721
2,777,950
2,784,263
2,799,001
2,799,010
2,808,507
2,809,236
2,810,068
2,830,200
2,833,994
2,834,879
2,835,794
2,852,730
2,860,239
2,883,521
2,888,652
2,899,547
2,901,601
2,912,573
2,918,571
2,924,705
2,925,562
2,938,082
2,963,577
2,966,585
2,968,739
2,974,221
2,984,740
2,994,844
3,009,115
3,014,127

Other U.S. Patents Pending

CONTENTS

SECTION PAGE

Guaranteed Performance Specifications ii
Radio Set Model Chart. vii
Accessory Group Chart viii

DESCRIPTION

Introduction. 1
Primary Power 1
Transmitters 1
Receivers 1
Power Supplies 2
Battery Saver Feature 2
The Netting Switch 3
Housing 3
Accessory Groups 3
Optional Accessories. 3

RECOMMENDED TEST EQUIPMENT 4

INSTALLATION AND OPERATION

Installing the Radio Set 5
Operating Instructions 5
Low Current Drain Modification for 12 Volt Systems 6

THEORY OF OPERATION

±12 Volt Functional Operation. 7
±6/12 Volt Functional Operation 8
Receiver. 9
Transmitter 14
Power Supplies. 16

SERVICE AIDS

Receiver. 20
Transmitter (30-50 Watts) 21
Transmitter (100 Watts). 23
Tone Oscillator Disassembly 25
Dual Squelch "Private-Line" Maintenance. 27
Accessory Conversion Instructions 29
"Extender" Servicing Procedure 31

±12 V "MOTRAC" MISCELLANEOUS PARTS LOCATION DETAIL 33

±6/12 V "MOTRAC" MISCELLANEOUS PARTS LOCATION DETAIL 35

HEAT SINK AND HOUSING DETAIL 37

TRANSMITTER ALIGNMENT PROCEDURE 39

"IDC" ADJUSTMENT PROCEDURE 40

RECEIVER ALIGNMENT PROCEDURE 41

RECEIVER ALIGNMENT PROCEDURE FOR "EXTENDER" MODELS 43

IMPORTANT

Service diagrams for these radio sets are in an additional booklet supplied with this instruction manual. Be sure to refer to the applicable Service Diagram Booklet listing on the next page.

SERVICE DIAGRAM BOOKLETS

30-50 W ±12 V Carrier Squelch Models	68P81014A40
30-50 W ±12 V Carrier Squelch Models With "Extender" Operation	68P81014A10
30-50 W ±12 V Dual Squelch Models	68P81014A50
30-50 W ±12 V Dual Squelch Models With "Extender" Operation	68P81014A20
100 W ±12 V Carrier Squelch Models	68P81014A45
100 W ±12 V Carrier Squelch Models With "Extender" Operation	68P81014A15
100 W ±12 V Dual Squelch Models	68P81014A55
100 W ±12 V Dual Squelch Models With "Extender" Operation	68P81014A25
30-50 W ±6/12 V Carrier Squelch Models	68P81014A60
30-50 W ±6/12 V Carrier Squelch Models With "Extender" Operation	68P81014A15
30-50 W ±6/12 V Dual Squelch Models	68P81014A65
30-50 W ±6/12 V Dual Squelch Models With "Extender" Operation	68P81014A35

RIES)

A

T

. RADIO SETS

'PLIED

SUPPLIED DEPENDING UPON
'REQUENCY.

		DUAL SQUELCH "PRIVATE-LINE"												CARRIER SQUELCH					
	GROUP NUMBER	DC3155CM	DC3155C	DC3165CM	DC3165C	DD3155CM	DD3155C	DD3165CM	DD3165C	DE3155BM	DE3155B	DE3165BM	DE3165B	DC1155CM	DC1155C	DC1165CM	DC1165C	DD1155CM	DD1155C
	TYPE OF INSTALLATION	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT
	XMTR. POWER	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	100 W	100 W	100 W	100 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W
	NO. OF FREQS.	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1
	MICROPHONE INCLUDED	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
	DESCRIPTION																		
	TROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																		
	NTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																		
	NTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																		
	ONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																		
	ONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																		
	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																		
	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																		
	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																		
	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																		
	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																		
	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																		
	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																		
E	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																		
AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																		
AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																		
7AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																		
26AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT	X	X							X	X								
026AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT			X	X							X	X						
6025AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT					X	X												
6025AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT							X	X										
N6026AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK -MOUNT													X	X				
N6026AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT															X	X		
CN6025AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																	X	X
TCN6025AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																		
TCN6030AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																		
TCN6030AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																		
TCN6027AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																		
TCN6027AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																		
TCN6030AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																		
TCN6030AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																		
TCN6027AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																		
TCN6027AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																		
TKN6055A	CABLE KIT, 1-FREQ.	X	X											X	X				
TKN6056A	CABLE KIT, 2-FREQ.			X	X											X	X		
TKN6059A	CABLE KIT, 1-FREQ.									X	X								
TKN6060A	CABLE KIT, 2-FREQ.											X	X						
TKN6096A	CABLE KIT, 1-FREQ.																		
TKN6097A	CABLE KIT, 2-FREQ.																		
TKN6057A	CABLE KIT, 1-FREQ.																		
TKN6058A	CABLE KIT, 2-FREQ.																		
TSN6000A	SPEAKER	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TLN6042A	INSTALLATION KIT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TMN6000A	MICROPHONE	X		X		X		X		X		X		X		X		X	
TU304L	ANTENNA, 25-30 MC, TRUNK-MOUNT	/	/	/	/					/	/	/	/	/	/	/	/		
TU304H	ANTENNA, 30-54 MC, TRUNK-MOUNT	/	/	/	/					/	/	/	/	/	/	/	/		
TU305L	ANTENNA, 25-30 MC, DASH-MOUNT					/	/	/	/									/	/
TU305H	ANTENNA, 30-54 MC, DASH-MOUNT					/	/	/	/									/	/
TLN6238A	MOUNTING BRACKET KIT					X	X	X	X									X	X
TLN6252A	NOISE REDUCTION KIT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

SERVICE DIAGRAM BOOKLETS

30-50 W ±12 V Carrier Squelch Models	68P81014A40
30-50 W ±12 V Carrier Squelch Models With "Extender" Operation	68P81014A10
30-50 W ±12 V Dual Squelch Models	68P81014A50
30-50 W ±12 V Dual Squelch Models With "Extender" Operation	68P81014A20
100 W ±12 V Carrier Squelch Models	68P81014A45
100 W ±12 V Carrier Squelch Models With "Extender" Operation	68P81014A15
100 W ±12 V Dual Squelch Models	68P81014A55
100 W ±12 V Dual Squelch Models With "Extender" Operation	68P81014A25
30-50 W ±6/12 V Carrier Squelch Models	68P81014A60
30-50 W ±6/12 V Carrier Squelch Models With "Extender" Operation	68P81014A15
30-50 W ±6/12 V Dual Squelch Models	68P81014A65
30-50 W ±6/12 V Dual Squelch Models With "Extender" Operation	68P81014A35

MOTOROLA

MODEL CHART
FOR
25-54 MC
"MOTRAC"
FM TWO-WAY MOBILE RADIO SETS

CODE:

☒ = ONE ITEM SUPPLIED.

⧄ = ONE ITEM SUPPLIED PER FIVE (OR LESS) RADIO SETS.

⧇ = ONE ITEM SUPPLIED DEPENDING UPON CARRIER FREQUENCY.

*REPRESENTS A SERIES OF MODELS AND NOT A SPECIFIC MODEL. THE SPECIFIC MODEL, AS STAMPED ON THE CHASSIS, IS DETERMINED BY ITS APPLICATION.

12 V DUAL SQUELCH "PRIVATE-LINE"

	MODEL	U41HHT-3100D	U41HHT-3110D	U41HHT-3130D	U51HHT-3100D	U51HHT-3110D	U51HHT-3130D	U71HHT-3100C	U71HHT-3110C	U71HHT-3130C
	RCVR FREQ'S	1	1	2	1	1	2	1	1	2
	XMTR FREQ'S	1	2	2	1	2	2	1	2	2
	XMTR POWER	30 W	30 W	30 W	50 W	50 W	50 W	100 W	100 W	100 W
	CHAN. SPAC.	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC
	ACCESSORY GROUPS	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)
ITEM	DESCRIPTION									
*TRB1120BF	RECEIVER 12 V, DUAL SQUELCH, 1-FREQ.	X	X		X	X		X	X	
*TRB1120BH	RECEIVER 12 V, DUAL SQUELCH, 2-FREQ.			X			X			X
*TRB1120BB	RECEIVER 12 V, CARRIER SQUELCH, 1-FREQ., 20 KC									
*TRB1120BD	RECEIVER 12 V, CARRIER SQUELCH, 2-FREQ., 20 KC									
*TRB1120BA	RECEIVER 12 V, CARRIER SQUELCH, 1-FREQ., 40 KC									
*TRB1120BC	RECEIVER 12 V, CARRIER SQUELCH , 2-FREQ., 40 KC									
*TRB1130BF	RECEIVER 6/12 V, DUAL SQUELCH, 1-FREQ.									
*TRB1130BH	RECEIVER 6/12 V, DUAL SQUELCH, 2-FREQ.									
*TRB1130BB	RECEIVER 6/12 V, CARRIER SQUELCH, 1-FREQ., 20 KC									
*TRB1130BD	RECEIVER 6/12 V, CARRIER SQUELCH, 2-FREQ., 20 KC									
*TRB1130BA	RECEIVER 6/12 V, CARRIER SQUELCH, 1-FREQ., 40 KC									
*TRB1130BC	RECEIVER 6/12 V, CARRIER SQUELCH, 2-FREQ., 40 KC									
*TRB1140BF	RECEIVER ("EXTENDER") 12 V, DUAL SQUELCH, 1-FREQ.									
*TRB1140BH	RECEIVER ("EXTENDER") 12 V, DUAL SQUELCH, 2-FREQ.									
*TRB1140BB	RECEIVER ("EXTENDER") 12 V, CARRIER SQUELCH, 1-FREQ.									
*TRB1140BD	RECEIVER ("EXTENDER") 12 V, CARRIER SQUELCH, 2-FREQ.									
*TRB1150BF	RECEIVER ("EXTENDER") 6/12 V, DUAL SQUELCH, 1-FREQ.									
*TRB1150BH	RECEIVER ("EXTENDER") 6/12 V, DUAL SQUELCH, 2-FREQ.									
*TRB1150BB	RECEIVER ("EXTENDER") 6/12 V, CARRIER SQUELCH, 1-FREQ.									
*TRB1150BD	RECEIVER ("EXTENDER") 6/12 V, CARRIER SQUELCH, 2-FREQ.									
*TTB1000BA	TRANSMITTER, 30-50 W, 1-FREQ.	X			X					
*TTB1000BB	TRANSMITTER, 30-50 W, 2-FREQ.		X	X		X	X			
*TTB1060AA	TRANSMITTER, 100 W, 1-FREQ.							X		
*TTB1060AB	TRANSMITTER, 100 W, 2-FREQ.								X	X
TPN1007AC	POWER SUPPLY, 12 V, DUAL SQUELCH, 30 WATT	X	X	X						
TPN1008AC	POWER SUPPLY, 12 V, DUAL SQUELCH, 50 WATT				X	X	X			
TPN1009AC	POWER SUPPLY, 12 V, DUAL SQUELCH, 100 WATT							X	X	X
TPN1007AA	POWER SUPPLY, 12 V, CARRIER SQUELCH, 30 WATT									
TPN1008AA	POWER SUPPLY, 12 V, CARRIER SQUELCH, 50 WATT									
TPN1009AA	POWER SUPPLY, 12 V, CARRIER SQUELCH, 100 WATT									
TPN1014AC	POWER SUPPLY, 6/12 V, DUAL SQUELCH, 30 WATT									
TPN1015AC	POWER SUPPLY, 6/12 V, DUAL SQUELCH, 50 WATT									
TPN1014AA	POWER SUPPLY, 6/12 V, CARRIER SQUELCH, 30 WATT									
TPN1015AA	POWER SUPPLY, 6/12 V, CARRIER SQUELCH, 50 WATT									
TLN6190A	FUSE KIT (100 WATT MODELS ONLY)							X	X	X
TGN6002A	FRONT PANEL (ALL RADIO SETS EXCEPT 6/12 V "EXTENDER" MODELS)	X	X	X	X	X	X	X	X	X
TGN6034A	FRONT PANEL (6/12 V "EXTENDER" MODELS ONLY)									
TKN6051A	INTER-CHASSIS CABLE KIT, 12 V, 1-FREQ. MODELS	X			X			X		
TKN6052A	INTER-CHASSIS CABLE KIT, 12 V, 2-FREQ. MODELS		X	X		X	X		X	X
TKN6053A	INTER-CHASSIS CABLE KIT, 6/12 V, 1-FREQ. MODELS									
TKN6054A	INTER-CHASSIS CABLE KIT, 6/12 V, 2-FREQ. MODELS									
THN6002A	HOUSING KIT	X	X	X	X	X	X	X	X	X
TLN6233A	UNIT HARDWARE KIT, 12 V MODELS	X	X	X	X	X	X	X	X	X
TLN6250A	UNIT HARDWARE KIT, 6/12 V MODELS									
TLN6366A	UNIT HARDWARE KIT, "EXTENDER" 12 V MODELS									
TLN6368A	UNIT HARDWARE KIT, "EXTENDER" 6/12 V MODELS									
ZNN-3A	CRYSTAL, TRANSMITTER CONTROL, 1-FREQ.	X			X			X		
ZNN-3-3A	CRYSTAL, TRANSMITTER CONTROL, 2-FREQ.		X	X		X	X		X	X
ZMM-14A	CRYSTAL, RECEIVER CONTROL, 25-42 MC, 1-FREQ.	O	O		O	O		O	O	
ZMM-14-14A	CRYSTAL, RECEIVER CONTROL, 25-42 MC, 2-FREQ.			O			O			O
ZMM-15A	CRYSTAL, RECEIVER CONTROL, 42-50 MC, 1-FREQ.	O	O		O	O		O	O	
ZMM-15-15A	CRYSTAL, RECEIVER CONTROL, 42-50 MC, 2-FREQ.			O			O			O
TU217L	"VIBRASENDER" RESONANT REED	X	X	X	X	X	X	X	X	X
TU333AL	"VIBRASPONDER" RESONANT REED	X	X	X	X	X	X	X	X	X
TLN6046A	TUNING TOOL KIT	/	/	/	/	/	/	/	/	/
TLN6376A	TUNING TOOL KIT ("EXTENDER" MODELS)									

12 V CARRIER SQUELCH

ITEM	U41HHT-1000D	U41HHT-1010D	U41HHT-1030D	U41HHT-1100D	U41HHT-1110D	U41HHT-1130D	U51HHT-1000D	U51HHT-1010D	U51HHT-1030D	U51HHT-1100D	U51HHT-1110D	U51HHT-1130D	U71HHT-1000C	U71HHT-1010C	U71HHT-1030C	U71HHT-1100C	U71HHT-1110C	U71HHT-1130C
RCVR FREQ'S	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2	1	1	2
XMTR FREQ'S	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2
XMTR POWER	30 W	30 W	30 W	30 W	30 W	30 W	50 W	50 W	50 W	50 W	50 W	50 W	100 W	100 W	100 W	100 W	100 W	100 W
CHAN. SPAC.	40 KC	40 KC	40 KC	20 KC	20 KC	20 KC	40 KC	40 KC	40 KC	20 KC	20 KC	20 KC	40 KC	40 KC	40 KC	20 KC	20 KC	20 KC
ACCESSORY GROUPS	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DD OR DE (1100 SERIES)	DD OR DE (1100 SERIES)	DD OR DE (1100 SERIES)	DD OR DE (1100 SERIES)	DD OR DE (1100 SERIES)	DD OR DE (1100 SERIES)
*TRB1120BF																		
*TRB1120BH																		
*TRB1120BB				X	X					X	X					X	X	
*TRB1120BD						X						X						X
*TRB1120BA	X	X					X	X					X	X				
*TRB1120BC			X						X						X			
*TRB1130BF																		
*TRB1130BH																		
*TRB1130BB																		
*TRB1130BD																		
*TRB1130BA																		
*TRB1130BC																		
*TRB1140BF																		
*TRB1140BH																		
*TRB1140BB																		
*TRB1140BD																		
*TRB1150BF																		
*TRB1150BH																		
*TRB1150BB																		
*TRB1150BD																		
*TTB1000BA	X			X			X			X								
*TTB1000BB		X	X		X	X		X	X		X	X						
*TTB1060AA													X			X		
*TTB1060AB														X	X		X	X
TPN1007AC																		
TPN1008AC																		
TPN1009AC																		
TPN1007AA	X	X	X	X	X	X												
TPN1008AA							X	X	X	X	X	X						
TPN1009AA													X	X	X	X	X	X
TPN1014AC																		
TPN1015AC																		
TPN1014AA																		
TPN1015AA																		
TLN6190A													X	X	X	X	X	X
TGN6002A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TGN6034A																		
TKN6051A	X			X			X			X			X			X		
TKN6052A		X	X		X	X		X	X		X	X		X	X		X	X
TKN6053A																		
TKN6054A																		
THN6002A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TLN6233A	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
TLN6250A																		
TLN6366A																		
TLN6368A																		
ZNN-3A	X			X			X			X			X			X		
ZNN-3-3A		X	X		X	X		X	X		X	X		X	X		X	X
ZMM-14A	O	O		O	O		O	O		O	O		O	O		O	O	
ZMM-14-14A			O			O			O			O			O			O
ZMM-15A	O	O		O	O		O	O		O	O		O	O		O	O	
ZMM-15-15A			O			O			O			O			O			O
TU217L																		
TU333AL																		
TLN6046A	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
TLN6376A																		

6/12 V DUAL SQUELCH "PRIVATE-LINE"

ITEM	U41HHT-3101C	U41HHT-3111C	U41HHT-3131C	U51HHT-3101C	U51HHT-3111C	U51HHT-3131C
RCVR FREQ'S	1	1	2	1	1	2
XMTR FREQ'S	1	2	2	1	2	2
XMTR POWER	30 W	30 W	30 W	50 W	50 W	50 W
CHAN. SPAC.	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC
ACCESSORY GROUPS	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)
*TRB1120BF						
*TRB1120BH						
*TRB1120BB						
*TRB1120BD						
*TRB1120BA						
*TRB1120BC						
*TRB1130BF	X	X		X	X	
*TRB1130BH			X			X
*TRB1130BB						
*TRB1130BD						
*TRB1130BA						
*TRB1130BC						
*TRB1140BF						
*TRB1140BH						
*TRB1140BB						
*TRB1140BD						
*TRB1150BF						
*TRB1150BH						
*TRB1150BB						
*TRB1150BD						
*TTB1000BA	X			X		
*TTB1000BB		X	X		X	X
*TTB1060AA						
*TTB1060AB						
TPN1007AC						
TPN1008AC						
TPN1009AC						
TPN1007AA						
TPN1008AA						
TPN1009AA						
TPN1014AC	X	X	X			
TPN1015AC				X	X	X
TPN1014AA						
TPN1015AA						
TLN6190A						
TGN6002A	X	X	X	X	X	X
TGN6034A						
TKN6051A						
TKN6052A						
TKN6053A	X			X		
TKN6054A		X	X		X	X
THN6002A	X	X	X	X	X	X
TLN6233A						
TLN6250A	X	X	X	X	X	X
TLN6366A						
TLN6368A						
ZNN-3A	X			X		
ZNN-3-3A		X	X		X	X
ZMM-14A	O	O		O	O	
ZMM-14-14A			O			O
ZMM-15A	O	O		O	O	
ZMM-15-15A			O			O
TU217L	X	X	X	X	X	X
TU333AL	X	X	X	X	X	X
TLN6046A	/	/	/	/	/	/
TLN6376A						

6/12 V CARRIER SQUELCH

ITEM	U41HHT-1001C	U41HHT-1011C	U41HHT-1031C	U41HHT-1101C	U41HHT-1111C	U41HHT-1131C	U51HHT-1001C	U51HHT-1011C	U51HHT-1031C	U51HHT-1101C	U51HHT-1111C	U51HHT-1131C
RCVR FREQ'S	1	1	2	1	1	2	1	1	2	1	1	2
XMTR FREQ'S	1	2	2	1	2	2	1	2	2	1	2	2
XMTR POWER	30 W	30 W	30 W	30 W	30 W	30 W	50 W	50 W	50 W	50 W	50 W	50 W
CHAN. SPAC.	40 KC	40 KC	40 KC	20 KC	20 KC	20 KC	40 KC	40 KC	40 KC	20 KC	20 KC	20 KC
ACCESSORY GROUPS	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)
*TRB1120BF												
*TRB1120BH												
*TRB1120BB												
*TRB1120BD												
*TRB1120BA												
*TRB1120BC												
*TRB1130BF												
*TRB1130BH												
*TRB1130BB				X	X					X	X	
*TRB1130BD						X						X
*TRB1130BA	X	X					X	X				
*TRB1130BC			X						X			
*TRB1140BF												
*TRB1140BH												
*TRB1140BB												
*TRB1140BD												
*TRB1150BF												
*TRB1150BH												
*TRB1150BB												
*TRB1150BD												
*TTB1000BA	X			X			X			X		
*TTB1000BB		X	X		X	X		X	X		X	X
*TTB1060AA												
*TTB1060AB												
TPN1007AC												
TPN1008AC												
TPN1009AC												
TPN1007AA												
TPN1008AA												
TPN1009AA												
TPN1014AC												
TPN1015AC												
TPN1014AA	X	X	X	X	X	X						
TPN1015AA							X	X	X	X	X	X
TLN6190A												
TGN6002A	X	X	X	X	X	X	X	X	X	X	X	X
TGN6034A												
TKN6051A												
TKN6052A												
TKN6053A	X			X			X			X		
TKN6054A		X	X		X	X		X	X		X	X
THN6002A	X	X	X	X	X	X	X	X	X	X	X	X
TLN6233A												
TLN6250A	X	X	X	X	X	X	X	X	X	X	X	X
TLN6366A												
TLN6368A												
ZNN-3A	X			X			X			X		
ZNN-3-3A		X	X		X	X		X	X		X	X
ZMM-14A	O	O		O	O		O	O		O	O	
ZMM-14-14A			O			O			O			O
ZMM-15A	O	O		O	O		O	O		O	O	
ZMM-15-15A			O			O			O			O
TU217L												
TU333AL												
TLN6046A	/	/	/	/	/	/	/	/	/	/	/	/
TLN6376A												

"EXTENDER" MODELS - 12 VOLT - DUAL SQUELCH "PRIVATE-LINE"

ITEM	U41HHT-3400B	U41HHT-3410B	U41HHT-3430B	U51HHT-3400B	U51HHT-3410B	U51HHT-3430B	U71HHT-3400B	U71HHT-3410B	U71HHT-3430B
RCVR FREQ'S	1	1	2	1	1	2	1	1	2
XMTR FREQ'S	1	2	2	1	2	2	1	2	2
XMTR POWER	30 W	30 W	30 W	50 W	50 W	50 W	100 W	100 W	100 W
CHAN. SPAC.	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC
ACCESSORY GROUPS	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DC OR DD (3100 SERIES)	DD OR DE (3100 SERIES)	DD OR DE (3100 SERIES)	DD OR DE (3100 SERIES)
*TRB1120BF									
*TRB1120BH									
*TRB1120BB									
*TRB1120BD									
*TRB1120BA									
*TRB1120BC									
*TRB1130BF									
*TRB1130BH									
*TRB1130BB									
*TRB1130BD									
*TRB1130BA									
*TRB1130BC									
*TRB1140BF	X	X		X	X		X	X	
*TRB1140BH			X			X			X
*TRB1140BB									
*TRB1140BD									
*TRB1150BF									
*TRB1150BH									
*TRB1150BB									
*TRB1150BD									
*TTB1000BA	X			X					
*TTB1000BB		X	X		X	X			
*TTB1060AA							X		
*TTB1060AB								X	X
TPN1007AC	X	X	X						
TPN1008AC				X	X	X			
TPN1009AC							X	X	X
TPN1007AA									
TPN1008AA									
TPN1009AA									
TPN1014AC									
TPN1015AC									
TPN1014AA									
TPN1015AA									
TLN6190A							X	X	X
TGN6002A	X	X	X	X	X	X	X	X	X
TGN6034A									
TKN6051A	X			X			X		
TKN6052A		X	X		X	X		X	X
TKN6053A									
TKN6054A									
THN6002A	X	X	X	X	X	X	X	X	X
TLN6233A									
TLN6250A									
TLN6366A	X	X	X	X	X	X	X	X	X
TLN6368A									
ZNN-3A	X			X			X		
ZNN-3-3A		X	X		X	X		X	X
ZMM-14A	O	O		O	O		O	O	
ZMM-14-14A			O			O			O
ZMM-15A	O	O		O	O		O	O	
ZMM-15-15A			O			O			O
TU217L	X	X	X	X	X	X	X	X	X
TU333AL	X	X	X	X	X	X	X	X	X
TLN6046A									
TLN6376A	/	/	/	/	/	/	/	/	/

"EXTENDER" MODELS - 12 V - CARRIER SQUELCH

ITEM	U41HHT-1400B	U41HHT-1410B	U41HHT-1430B	U51HHT-1400B	U51HHT-1410B	U51HHT-1430B	U71HHT-1400B	U71HHT-1410B	U71HHT-1430B
RCVR FREQ'S	1	1	2	1	1	2	1	1	2
XMTR FREQ'S	1	2	2	1	2	2	1	2	2
XMTR POWER	30 W	30 W	30 W	50 W	50 W	50 W	100 W	100 W	100 W
CHAN. SPAC.	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC
ACCESSORY GROUPS	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DC OR DD (1100 SERIES)	DD OR DE (1100 SERIES)	DD OR DE (1100 SERIES)	DD OR DE (1100 SERIES)
*TRB1120BF									
*TRB1120BH									
*TRB1120BB									
*TRB1120BD									
*TRB1120BA									
*TRB1120BC									
*TRB1130BF									
*TRB1130BH									
*TRB1130BB									
*TRB1130BD									
*TRB1130BA									
*TRB1130BC									
*TRB1140BF									
*TRB1140BH									
*TRB1140BB	X	X		X	X		X	X	
*TRB1140BD			X			X			X
*TRB1150BF									
*TRB1150BH									
*TRB1150BB									
*TRB1150BD									
*TTB1000BA	X			X					
*TTB1000BB		X	X		X	X			
*TTB1060AA							X		
*TTB1060AB								X	X
TPN1007AC									
TPN1008AC									
TPN1009AC									
TPN1007AA	X	X	X						
TPN1008AA				X	X	X			
TPN1009AA							X	X	X
TPN1014AC									
TPN1015AC									
TPN1014AA									
TPN1015AA									
TLN6190A							X	X	X
TGN6002A	X	X	X	X	X	X	X	X	X
TGN6034A									
TKN6051A	X			X			X		
TKN6052A		X	X		X	X		X	X
TKN6053A									
TKN6054A									
THN6002A	X	X	X	X	X	X	X	X	X
TLN6233A									
TLN6250A									
TLN6366A	X	X	X	X	X	X	X	X	X
TLN6368A									
ZNN-3A	X			X			X		
ZNN-3-3A		X	X		X	X		X	X
ZMM-14A	O	O		O	O		O	O	
ZMM-14-14A			O			O			O
ZMM-15A	O	O		O	O		O	O	
ZMM-15-15A			O			O			O
TU217L									
TU333AL									
TLN6046A									
TLN6376A	/	/	/	/	/	/	/	/	/

"EXTENDER" MODELS - 6/12 V - DUAL SQUELCH "PRIVATE-LINE"

ITEM	U41HHT-3401B	U41HHT-3411B	U41HHT-3431B	U51HHT-3401B	U51HHT-3411B	U51HHT-3431B
RCVR FREQ'S	1	1	2	1	1	2
XMTR FREQ'S	1	2	2	1	2	2
XMTR POWER	30 W	30 W	30 W	50 W	50 W	50 W
CHAN. SPAC.	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC
ACCESSORY GROUPS	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)	DC OR DD (3000 OR 3100 SERIES)
*TRB1120BF						
*TRB1120BH						
*TRB1120BB						
*TRB1120BD						
*TRB1120BA						
*TRB1120BC						
*TRB1130BF						
*TRB1130BH						
*TRB1130BB						
*TRB1130BD						
*TRB1130BA						
*TRB1130BC						
*TRB1140BF						
*TRB1140BH						
*TRB1140BB						
*TRB1140BD						
*TRB1150BF	X	X		X	X	
*TRB1150BH			X			X
*TRB1150BB						
*TRB1150BD						
*TTB1000BA	X			X		
*TTB1000BB		X	X		X	X
*TTB1060AA						
*TTB1060AB						
TPN1007AC						
TPN1008AC						
TPN1009AC						
TPN1007AA						
TPN1008AA						
TPN1009AA						
TPN1014AC	X	X	X			
TPN1015AC				X	X	X
TPN1014AA						
TPN1015AA						
TLN6190A						
TGN6002A						
TGN6034A	X	X	X	X	X	X
TKN6051A						
TKN6052A						
TKN6053A	X			X		
TKN6054A		X	X		X	X
THN6002A	X	X	X	X	X	X
TLN6233A						
TLN6250A						
TLN6366A						
TLN6368A	X	X	X	X	X	X
ZNN-3A	X			X		
ZNN-3-3A		X	X		X	X
ZMM-14A	O	O		O	O	
ZMM-14-14A			O			O
ZMM-15A	O	O		O	O	
ZMM-15-15A			O			O
TU217L	X	X	X	X	X	X
TU333AL	X	X	X	X	X	X
TLN6046A						
TLN6376A	/	/	/	/	/	/

"EXTENDER" MODELS - 6/12 V - CARRIER SQUELCH

ITEM	U41HHT-1401B	U41HHT-1411B	U41HHT-1431B	U51HHT-1401B	U51HHT-1411B	U51HHT-1431B
RCVR FREQ'S	1	1	2	1	1	2
XMTR FREQ'S	1	2	2	1	2	2
XMTR POWER	30 W	30 W	30 W	50 W	50 W	50 W
CHAN. SPAC.	20 KC	20 KC	20 KC	20 KC	20 KC	20 KC
ACCESSORY GROUPS	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)	DC OR DD (1000 OR 1100 SERIES)
*TRB1120BF						
*TRB1120BH						
*TRB1120BB						
*TRB1120BD						
*TRB1120BA						
*TRB1120BC						
*TRB1130BF						
*TRB1130BH						
*TRB1130BB						
*TRB1130BD						
*TRB1130BA						
*TRB1130BC						
*TRB1140BF						
*TRB1140BH						
*TRB1140BB						
*TRB1140BD						
*TRB1150BF						
*TRB1150BH						
*TRB1150BB	X	X		X	X	
*TRB1150BD			X			X
*TTB1000BA	X			X		
*TTB1000BB		X	X		X	X
*TTB1060AA						
*TTB1060AB						
TPN1007AC						
TPN1008AC						
TPN1009AC						
TPN1007AA						
TPN1008AA						
TPN1009AA						
TPN1014AC						
TPN1015AC						
TPN1014AA	X	X	X			
TPN1015AA				X	X	X
TLN6190A						
TGN6002A						
TGN6034A	X	X	X	X	X	X
TKN6051A						
TKN6052A						
TKN6053A	X			X		
TKN6054A		X	X		X	X
THN6002A	X	X	X	X	X	X
TLN6233A						
TLN6250A						
TLN6366A						
TLN6368A	X	X	X	X	X	X
ZNN-3A	X			X		
ZNN-3-3A		X	X		X	X
ZMM-14A	O	O		O	O	
ZMM-14-14A			O			O
ZMM-15A	O	O		O	O	
ZMM-15-15A			O			O
TU217L						
TU333AL						
TLN6046A						
TLN6376A	/	/	/	/	/	/

DUAL SQUELCH "PRIVATE-LINE"				
DC3055BM	6V TRUNK-MOUNT	30-50 W	1	YES
DC3055B	6V TRUNK-MOUNT	30-50 W	1	NO
DC3065BM	6V TRUNK-MOUNT	30-50 W	2	YES
DC3065B	6V TRUNK-MOUNT	30-50 W	2	NO
DD3055BM	6V DASH-MOUNT	30-50 W	1	YES
DD3055B	6V DASH-MOUNT	30-50 W	1	NO
DD3065BM	6V DASH-MOUNT	30-50 W	2	YES
DD3065B	6V DASH-MOUNT	30-50 W	2	NO
CARRIER SQUELCH				
DC1055BM	6V TRUNK-MOUNT	30-50 W	1	YES
DC1055B	6V TRUNK-MOUNT	30-50 W	1	NO
DC1065BM	6V TRUNK-MOUNT	30-50 W	2	YES
DC1065B	6V TRUNK-MOUNT	30-50 W	2	NO
DD1055BM	6V DASH-MOUNT	30-50 W	1	YES
DD1055B	6V DASH-MOUNT	30-50 W	1	NO
DD1065BM	6V DASH-MOUNT	30-50 W	2	YES
DD1065B	6V DASH-MOUNT	30-50 W	2	NO
"EXTENDER" DUAL SQUELCH "PRIVATE-LINE"				
DC3154AM	12V TRUNK-MOUNT	30-50 W	1	YES
DC3154A	12V TRUNK-MOUNT	30-50 W	1	NO
DC3164AM	12V TRUNK-MOUNT	30-50 W	2	YES
DC3164A	12V TRUNK-MOUNT	30-50 W	2	NO
DD3154AM	12V DASH-MOUNT	30, 50, 100 W	1	YES
DD3154A	12V DASH-MOUNT	30, 50, 100 W	1	NO
DD3164AM	12V DASH-MOUNT	30, 50, 100 W	2	YES
DD3164A	12V DASH-MOUNT	30, 50, 100 W	2	NO
DE3154AM	12V TRUNK-MOUNT	100 W	1	YES
DE3154A	12V TRUNK-MOUNT	100 W	1	NO
DE3164AM	12V TRUNK-MOUNT	100 W	2	YES
DE3164A	12V TRUNK-MOUNT	100 W	2	NO
"EXTENDER" CARRIER SQUELCH				
DC1154AM	12V TRUNK-MOUNT	30-50 W	1	YES
DC1154A	12V TRUNK-MOUNT	30-50 W	1	NO
DC1164AM	12V TRUNK-MOUNT	30-50 W	2	YES
DC1164A	12V TRUNK-MOUNT	30-50 W	2	NO
DD1154AM	12V DASH-MOUNT	30, 50, 100 W	1	YES
DD1154A	12V DASH-MOUNT	30, 50, 100 W	1	NO
DD1164AM	12V DASH-MOUNT	30, 50, 100 W	2	YES
DD1164A	12V DASH-MOUNT	30, 50, 100 W	2	NO
DE1154AM	12V TRUNK-MOUNT	100 W	1	YES
DE1154A	12V TRUNK-MOUNT	100 W	1	NO
DE1164AM	12V TRUNK-MOUNT	100 W	2	YES
DE1164A	12V TRUNK-MOUNT	100 W	2	NO
"EXTENDER" DUAL SQUELCH "PRIVATE-LINE"				
DC3054AM	6V TRUNK-MOUNT	30-50 W	1	YES
DC3054A	6V TRUNK-MOUNT	30-50 W	1	NO
DC3064AM	6V TRUNK-MOUNT	30-50 W	2	YES
DC3064A	6V TRUNK-MOUNT	30-50 W	2	NO
DD3054AM	6V DASH-MOUNT	30, 50, 100 W	1	YES
DD3054A	6V DASH-MOUNT	30, 50, 100 W	1	NO
DD3064AM	6V DASH-MOUNT	30, 50, 100 W	2	YES
DD3064A	6V DASH-MOUNT	30, 50, 100 W	2	NO
"EXTENDER" CARRIER SQUELCH				
DC1054AM	6V TRUNK-MOUNT	30-50 W	1	YES
DC1054A	6V TRUNK-MOUNT	30-50 W	1	NO
DC1064AM	6V TRUNK-MOUNT	30-50 W	2	YES
DC1064A	6V TRUNK-MOUNT	30-50 W	2	NO
DD1054AM	6V DASH-MOUNT	30, 50, 100 W	1	YES
DD1054A	6V DASH-MOUNT	30, 50, 100 W	1	NO
DD1064AM	6V DASH-MOUNT	30, 50, 100 W	2	YES
DD1064A	6V DASH-MOUNT	30, 50, 100 W	2	NO

DESCRIPTION

1. INTRODUCTION

The Motorola "Motrac" radio is a mobile FM two-way radio with a fully transistorized receiver and power supply. The advantages of the transistor -- reliability, lightweight, compact size, reduced maintenance and operating costs -- are fully utilized. A wide variety of models are available with 30, 50 or 100 watt transmitter r-f power output, "Extender" operation, carrier or dual squelch "Private-Line" operation and ±12 volt or ±6/12 volt primary inputs. Refer to the model chart at the front of this manual for a listing of the various models available in the 25-54 mc frequency range.

2. PRIMARY POWER

a. ±12 VDC Models

The power supplies used in ±12 v d-c models are equipped with a polarity reversing plug and receptacle. Positive (+) ground operation is accomplished by inserting the plug in the receptacle so that the red area of the receptacle is visible. Negative (-) ground operation is accomplished by inserting the plug so that the white area of the receptacle is visible.

b. ±6/12 VDC Models

The power supplies used in ±6/12 v d-c models are equipped with a voltage plug and receptacle in addition to the polarity plug and receptacle previously described for ±12 v d-c models. When the voltage plug is inserted in the receptacle so that the yellow portion of the receptacle is visible, the radio set will operate from a 6 v d-c source. When the plug is inserted so that the green area is visible, the radio set will operate from a 12 v d-c source.

NOTE

In "Extender" models, a gray lead terminated in a red coded pin-tip connector is inserted in a jack in the exposed portion of the voltage receptacle. The jack is also identified by red coding. This lead must be inserted in the red coded jack in the yellow portion of the receptacle for 6 volt operation or the red coded jack in the green portion of the receptacle for 12 volt operation.

3. TRANSMITTERS

The transmitters provide 30, 50 or 100 watts r-f power output depending upon the radio set and transmitter models. Refer to the model chart at the front of this manual for detailed information. These transmitters use a transistorized audio amplifier and IDC ("Instantaneous Deviation Control") circuit. Heat radiators dissipate the heat produced by the driver and power output stages.

4. RECEIVERS

a. "Extender" Models

Electrical impulse and ignition noises can seriously hamper two-way radio communications. Many methods such as bypassing and shielding of noise radiating leads have been used in the past but are effective only in suppressing noise generated by the particular vehicle in which the shielding etc. has been done. A large amount of present two-way radio operation is performed in close proximity to other vehicles which are not suppressed.

Each time a spark plug fires or a contact carrying current to an inductive load opens, a sharp noise pulse occurs. This pulse has a very rapid rise time and contains r-f frequencies ranging from a few kilocycles to hundreds of megacycles. These pulses are radiated in much the same way as r-f signals. In weak signal areas these pulses can be of sufficient amplitude to override the desired r-f signal and seriously affect the operation of conventional receivers.

An ideal noise suppression procedure would be to block the undesired noise in the receiver and pass only the desired information to the speaker. This would effectively suppress impulse noises generated by all vehicles in the area and greatly extend the operating range of two-way radio equipment. Motorola's "Motrac" radio sets with "Extender" operation are equipped to operate in this manner.

The "Extender" circuit samples r-f energy reaching the antenna, detects the impulse noise in a separate channel and applies cut-off bias pulses to the second r-f stage to silence the receiver for the duration of the impulse noise bursts. An impulse noise burst is extremely

MOTOROLA

ACCESSORY GROUP CHART
FOR
25-54 MC
"MOTRAC"
FM TWO-WAY MOBILE RADIO SETS

CODE:
☒= ONE ITEM SUPPLIED
⧄= ONE ITEM SUPPLIED DEPENDING UPON CARRIER FREQUENCY.

	GROUP NUMBER	DC3155CM	DC3155C	DC3165CM	DC3165C	DD3155CM	DD3155C	DD3165CM	DD3165C	DE3155BM	DE3155B	DE3165BM	DE3165B	DC1155CM	DC1155C	DC1165CM	DC1165C	DD1155CM	DD1155C	DD1165CM	DD1165C	DE1155BM	DE1155B	DE1165BM	DE1165B
		DUAL SQUELCH "PRIVATE-LINE"												CARRIER SQUELCH											
	TYPE OF INSTALLATION	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT
	XMTR. POWER	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	100 W	100 W	100 W	100 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	100 W	100 W	100 W	100 W
	NO. OF FREQS.	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	MICROPHONE INCLUDED	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
ITEM	DESCRIPTION																								
TCN6046AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6046AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6048AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6048AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6046AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6046AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6048AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6048AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6045AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6045AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6045AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6045AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6047AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6047AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6047AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6047AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6026AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT	☒	☒							☒	☒														
TCN6026AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT			☒	☒							☒	☒												
TCN6025AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT					☒	☒																		
TCN6025AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT							☒	☒																
TCN6026AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT													☒	☒							☒	☒		
TCN6026AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT															☒	☒							☒	☒
TCN6025AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																	☒	☒						
TCN6025AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																			☒	☒				
TCN6030AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6030AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6027AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6027AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6030AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6030AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6027AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6027AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TKN6055A	CABLE KIT, 1-FREQ.	☒	☒											☒	☒										
TKN6056A	CABLE KIT, 2-FREQ.			☒	☒											☒	☒								
TKN6059A	CABLE KIT, 1-FREQ.									☒	☒											☒	☒		
TKN6060A	CABLE KIT, 2-FREQ.											☒	☒											☒	☒
TKN6096A	CABLE KIT, 1-FREQ.																								
TKN6097A	CABLE KIT, 2-FREQ.																								
TKN6057A	CABLE KIT, 1-FREQ.																								
TKN6058A	CABLE KIT, 2-FREQ.																								
TSN6000A	SPEAKER	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TLN6042A	INSTALLATION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TMN6000A	MICROPHONE	☒		☒		☒		☒		☒		☒		☒		☒		☒		☒		☒		☒	
TU304L	ANTENNA, 25-30 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TU304H	ANTENNA, 30-54 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TU305L	ANTENNA, 25-30 MC, DASH-MOUNT					⧄	⧄	⧄	⧄									⧄	⧄	⧄	⧄				
TU305H	ANTENNA, 30-54 MC, DASH-MOUNT					⧄	⧄	⧄	⧄									⧄	⧄	⧄	⧄				
TLN6238A	MOUNTING BRACKET KIT					☒	☒	☒	☒									☒	☒	☒	☒				
TLN6252A	NOISE REDUCTION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

	GROUP NUMBER	DC3055BM	DC3055B	DC3065BM	DC3065B	DD3055BM	DD3055B	DD3065BM	DD3065B	DC1055BM	DC1055B	DC1065BM	DC1065B	DD1055BM	DD1055B	DD1065BM	DD1065B
		DUAL SQUELCH "PRIVATE-LINE"								CARRIER SQUELCH							
	TYPE OF INSTALLATION	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT
	XMTR. POWER	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W	30-50 W
	NO. OF FREQS.	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	MICROPHONE INCLUDED	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
ITEM	DESCRIPTION																
TCN6046AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6046AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6048AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6048AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6046AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6046AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6048AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6048AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6045AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6045AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6045AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6045AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6047AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6047AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6047AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6047AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6026AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6026AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6025AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6025AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6026AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6026AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6025AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6025AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6030AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT	☒	☒														
TCN6030AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT			☒	☒												
TCN6027AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT					☒	☒										
TCN6027AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT							☒	☒								
TCN6030AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT									☒	☒						
TCN6030AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT											☒	☒				
TCN6027AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT													☒	☒		
TCN6027AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT															☒	☒
TKN6055A	CABLE KIT, 1-FREQ.																
TKN6056A	CABLE KIT, 2-FREQ.																
TKN6059A	CABLE KIT, 1-FREQ.																
TKN6060A	CABLE KIT, 2-FREQ.																
TKN6096A	CABLE KIT, 1-FREQ.																
TKN6097A	CABLE KIT, 2-FREQ.																
TKN6057A	CABLE KIT, 1-FREQ.	☒	☒							☒	☒						
TKN6058A	CABLE KIT, 2-FREQ.			☒	☒							☒	☒				
TSN6000A	SPEAKER	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TLN6042A	INSTALLATION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TMN6000A	MICROPHONE	☒		☒		☒		☒		☒		☒		☒		☒	
TU304L	ANTENNA, 25-30 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄				
TU304H	ANTENNA, 30-54 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄				
TU305L	ANTENNA, 25-30 MC, DASH-MOUNT					⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TU305H	ANTENNA, 30-54 MC, DASH-MOUNT					⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TLN6238A	MOUNTING BRACKET KIT					☒	☒	☒	☒					☒	☒	☒	☒
TLN6252A	NOISE REDUCTION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

	GROUP NUMBER	DC3154AM	DC3154A	DC3164AM	DC3164A	DD3154AM	DD3154A	DD3164AM	DD3164A	DE3154AM	DE3154A	DE3164AM	DE3164A	DC1154AM	DC1154A	DC1164AM	DC1164A	DD1154AM	DD1154A	DD1164AM	DD1164A	DE1154AM	DE1154A	DE1164AM	DE1164A
		"EXTENDER" DUAL SQUELCH "PRIVATE-LINE"												"EXTENDER" CARRIER SQUELCH											
	TYPE OF INSTALLATION	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V DASH-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT	12V TRUNK-MOUNT
	XMTR. POWER	30-50 W	30-50 W	30-50 W	30-50 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W	100 W	100 W	100 W	100 W	30-50 W	30-50 W	30-50 W	30-50 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W	100 W	100 W	100 W	100 W
	NO. OF FREQS.	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	MICROPHONE INCLUDED	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
ITEM	DESCRIPTION																								
TCN6046AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT	☒	☒							☒	☒														
TCN6046AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT			☒	☒							☒	☒												
TCN6048AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT					☒	☒																		
TCN6048AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT							☒	☒																
TCN6046AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT													☒	☒							☒	☒		
TCN6046AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT															☒	☒							☒	☒
TCN6048AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																	☒	☒						
TCN6048AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																			☒	☒				
TCN6045AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6045AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6045AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6045AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6047AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6047AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6047AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6047AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6026AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6026AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6025AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6025AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6026AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6026AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6025AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6025AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6030AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6030AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6027AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6027AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TCN6030AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																								
TCN6030AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																								
TCN6027AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																								
TCN6027AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																								
TKN6055A	CABLE KIT, 1-FREQ.	☒	☒											☒	☒										
TKN6056A	CABLE KIT, 2-FREQ.			☒	☒											☒	☒								
TKN6059A	CABLE KIT, 1-FREQ.									☒	☒											☒	☒		
TKN6060A	CABLE KIT, 2-FREQ.											☒	☒											☒	☒
TKN6096A	CABLE KIT, 1-FREQ.																								
TKN6097A	CABLE KIT, 2-FREQ.																								
TKN6057A	CABLE KIT, 1-FREQ.																								
TKN6058A	CABLE KIT, 2-FREQ.																								
TSN6000A	SPEAKER	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TLN6042A	INSTALLATION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TMN6000A	MICROPHONE	☒		☒		☒		☒		☒		☒		☒		☒		☒		☒		☒		☒	
TU304L	ANTENNA, 25-30 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TU304H	ANTENNA, 30-54 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TU305L	ANTENNA, 25-30 MC, DASH-MOUNT					⧄	⧄	⧄	⧄									⧄	⧄	⧄	⧄				
TU305H	ANTENNA, 30-54 MC, DASH-MOUNT					⧄	⧄	⧄	⧄									⧄	⧄	⧄	⧄				
TLN6238A	MOUNTING BRACKET KIT					☒	☒	☒	☒									☒	☒	☒	☒				
TLN6252A	NOISE REDUCTION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

	GROUP NUMBER	DC3054AM	DC3054A	DC3064AM	DC3064A	DD3054AM	DD3054A	DD3064AM	DD3064A	DC1054AM	DC1054A	DC1064AM	DC1064A	DD1054AM	DD1054A	DD1064AM	DD1064A
		"EXTENDER" DUAL SQUELCH "PRIVATE-LINE"								"EXTENDER" CARRIER SQUELCH							
	TYPE OF INSTALLATION	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V TRUNK-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT	6V DASH-MOUNT
	XMTR. POWER	30-50 W	30-50 W	30-50 W	30-50 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W	30-50 W	30-50 W	30-50 W	30-50 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W	30, 50, 100 W
	NO. OF FREQS.	1	1	2	2	1	1	2	2	1	1	2	2	1	1	2	2
	MICROPHONE INCLUDED	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
ITEM	DESCRIPTION																
TCN6046AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6046AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6048AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6048AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6046AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6046AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6048AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6048AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6045AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT	☒	☒														
TCN6045AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT			☒	☒												
TCN6045AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT									☒	☒						
TCN6045AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT											☒	☒				
TCN6047AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT													☒	☒		
TCN6047AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT															☒	☒
TCN6047AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT					☒	☒										
TCN6047AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT							☒	☒								
TCN6026AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6026AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6025AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6025AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6026AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6026AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6025AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6025AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6030AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6030AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6027AG	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6027AH	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TCN6030AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., TRUNK-MOUNT																
TCN6030AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., TRUNK-MOUNT																
TCN6027AE	CONTROL HEAD, WITH MIC. CONNECTOR, 1-FREQ., DASH-MOUNT																
TCN6027AF	CONTROL HEAD, WITH MIC. CONNECTOR, 2-FREQ., DASH-MOUNT																
TKN6055A	CABLE KIT, 1-FREQ.																
TKN6056A	CABLE KIT, 2-FREQ.																
TKN6059A	CABLE KIT, 1-FREQ.																
TKN6060A	CABLE KIT, 2-FREQ.																
TKN6096A	CABLE KIT, 1-FREQ.	☒	☒							☒	☒						
TKN6097A	CABLE KIT, 2-FREQ.			☒	☒							☒	☒				
TKN6057A	CABLE KIT, 1-FREQ.																
TKN6058A	CABLE KIT, 2-FREQ.																
TSN6000A	SPEAKER	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TLN6042A	INSTALLATION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒
TMN6000A	MICROPHONE	☒		☒		☒		☒		☒		☒		☒		☒	
TU304L	ANTENNA, 25-30 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄				
TU304H	ANTENNA, 30-54 MC, TRUNK-MOUNT	⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄				
TU305L	ANTENNA, 25-30 MC, DASH-MOUNT					⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TU305H	ANTENNA, 30-54 MC, DASH-MOUNT					⧄	⧄	⧄	⧄					⧄	⧄	⧄	⧄
TLN6238A	MOUNTING BRACKET KIT					☒	☒	☒	☒					☒	☒	☒	☒
TLN6252A	NOISE REDUCTION KIT	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒	☒

EPD-6482-B

DESCRIPTION

1. INTRODUCTION

The Motorola "Motrac" radio is a mobile FM two-way radio with a fully transistorized receiver and power supply. The advantages of the transistor -- reliability, lightweight, compact size, reduced maintenance and operating costs -- are fully utilized. A wide variety of models are available with 30, 50 or 100 watt transmitter r-f power output, "Extender" operation, carrier or dual squelch "Private-Line" operation and ±12 volt or ±6/12 volt primary inputs. Refer to the model chart at the front of this manual for a listing of the various models available in the 25-54 mc frequency range.

2. PRIMARY POWER

a. ±12 VDC Models

The power supplies used in ±12 v d-c models are equipped with a polarity reversing plug and receptacle. Positive (+) ground operation is accomplished by inserting the plug in the receptacle so that the red area of the receptacle is visible. Negative (-) ground operation is accomplished by inserting the plug so that the white area of the receptacle is visible.

b. ±6/12 VDC Models

The power supplies used in ±6/12 v d-c models are equipped with a voltage plug and receptacle in addition to the polarity plug and receptacle previously described for ±12 v d-c models. When the voltage plug is inserted in the receptacle so that the yellow portion of the receptacle is visible, the radio set will operate from a 6 v d-c source. When the plug is inserted so that the green area is visible, the radio set will operate from a 12 v d-c source.

NOTE

In "Extender" models, a gray lead terminated in a red coded pin-tip connector is inserted in a jack in the exposed portion of the voltage receptacle. The jack is also identified by red coding. This lead must be inserted in the red coded jack in the yellow portion of the receptacle for 6 volt operation or the red coded jack in the green portion of the receptacle for 12 volt operation.

3. TRANSMITTERS

The transmitters provide 30, 50 or 100 watts r-f power output depending upon the radio set and transmitter models. Refer to the model chart at the front of this manual for detailed information. These transmitters use a transistorized audio amplifier and IDC ("Instantaneous Deviation Control") circuit. Heat radiators dissipate the heat produced by the driver and power output stages.

4. RECEIVERS

a. "Extender" Models

Electrical impulse and ignition noises can seriously hamper two-way radio communications. Many methods such as bypassing and shielding of noise radiating leads have been used in the past but are effective only in suppressing noise generated by the particular vehicle in which the shielding etc. has been done. A large amount of present two-way radio operation is performed in close proximity to other vehicles which are not suppressed.

Each time a spark plug fires or a contact carrying current to an inductive load opens, a sharp noise pulse occurs. This pulse has a very rapid rise time and contains r-f frequencies ranging from a few kilocycles to hundreds of megacycles. These pulses are radiated in much the same way as r-f signals. In weak signal areas these pulses can be of sufficient amplitude to override the desired r-f signal and seriously affect the operation of conventional receivers.

An ideal noise suppression procedure would be to block the undesired noise in the receiver and pass only the desired information to the speaker. This would effectively suppress impulse noises generated by all vehicles in the area and greatly extend the operating range of two-way radio equipment. Motorola's "Motrac" radio sets with "Extender" operation are equipped to operate in this manner.

The "Extender" circuit samples r-f energy reaching the antenna, detects the impulse noise in a separate channel and applies cut-off bias pulses to the second r-f stage to silence the receiver for the duration of the impulse noise bursts. An impulse noise burst is extremely short in duration (a few microseconds) and silencing the receiver for this period of time does not remove desired information from the received signal. The time required to transmit a single syllable can exceed the duration of an impulse noise burst by a ratio somewhere in the vicinity of 100, 000 to 1.

b. Carrier Squelch Models

These models include a noise-actuated squelch circuit consisting of a noise limiter, a noise detector and a d-c control stage (switching circuit) to cut off the audio amplifier. This eliminates disturbing noise which would otherwise be heard at the speaker during intervals between received messages.

c. Dual Squelch "Private-Line" Models

These radio sets are an improvement in FM two-way radio equipment especially when operating under crowded channel conditions. Several "Private-Line" networks can use the same r-f carrier frequency in the same area when each network uses a different "Private-Line" tone frequency.

The transmitters are modulated by a continuous sub-audio frequency tone signal in addition to the voice modulation. The receivers accept only correctly tone-modulated signals when the "PL"-ON-OFF switch is in the ON position and reject all others.

Dual squelch "Private-Line" models also include noise-actuated squelch circuitry as previously described for carrier squelch models. This enables the operator to monitor the channel before transmissions ("PL"-ON-OFF switch in OFF position) and prevent interference with other users of the frequency. The TLN6246A Hang-Up Switch Box is available as an optional accessory to provide automatic switching to the noise-actuated squelch circuit when the microphone is picked up.

The squelch control is not used in "Private-Line" operation and the setting of it does not affect the "Private-Line" circuit. In carrier (noise-actuated) squelch operation, however, it must be set for proper operation as described under OPERATING INSTRUCTIONS.

In dual squelch "Private-Line" models, the "Private-Line" circuit is operative at all times. The "PL"-ON-OFF switch on the control head places the noise-actuated squelch circuit in or out of operation.

5. POWER SUPPLIES

The fully transistorized power supplies use long-life transistors in place of vibrator units. Vibrator replacement costs are eliminated and at the same time the overall radio set operation is improved. Silicon diode rectifiers are used to provide the greatest efficiency. All operating voltages for the transmitter are provided by the power supply. Heat sinks along the sides of the housing surround the power supply transistors.

6. BATTERY SAVER FEATURE

A unique feature of the "Motrac" radio set is the "battery saver" circuit. This circuit permits the power to be removed from the transmitter filaments and associated power supply when the radio set is used for receive operation only. The "battery saver" feature frequently eliminates the need for special generators and engine idling to supply current for radio operation. Thus, gas consumption and maintenance costs of the vehicle are greatly reduced. The receiver operates independently of the transmitter and associated power supply. The battery power for the transmitter filaments and power supply is supplied through the vehicle ignition switch, while the power for the receiver is applied directly. Therefore, with the ignition switch "off" and the radio set "on", the battery is used for the receiver only.

Power consumption is minimized by the use of transistors in the receiver. Actual current drain during standby operation ("battery saver" in operation and the crystal heaters off) is only 350 milliamperes (13.8 v d-c input) or 2.1 amperes (6.6 v d-c input). The low drain insures a longer battery life compared with a conventional higher drain radio set that uses vacuum tubes and is not equipped with the "battery saver" feature.

If desired, the standby primary current drain in models equipped with 12 volt control heads can be reduced to approximately 150 ma. This is done by relocating the electrical connections to the green pilot lamp in the control head. Although not normally recommended, this may be done when extremely low primary current drain is required. Refer to the INSTALLATION AND OPERATION section of this manual for instructions.

NOTE

This modification cannot be made in 6 volt control heads.

7. THE NETTING SWITCH

A netting switch, exclusive with "Motrac" radio equipment, allows a rapid check and adjustment of receiver and transmitter frequencies. Pressing this switch causes the receiver and transmitter to function simultaneously. If one of the two units is known to be "on frequency" the oscillator of the other may then be adjusted by the serviceman with a minimum of test equipment.

8. HOUSING

The basic radio set consists of a transmitter, receiver and power supply assembled together to form a drawer unit which slides into the housing. All external connections are made through receptacles on the front panel.

The "Motrac" radio set uses heat sinks (radiators) to dissipate heat generated in the power supply and transmitter so that venting of the housing is unnecessary. This keeps components free of dust etc. and eliminates servicing resulting from entrance of contaminants through a vented housing.

The radio set housing can be mounted either under the vehicle dashboard or in the trunk. The same drawer assembly; including transmitter, receiver and power supply, slides into the housing in either type of installation. In mobile radio fleets, where both dash and trunk-mount installations are used, this design provides full flexibility in exchanging radio sets between vehicles. Trunk-mounted radio sets are remotely controlled by means of a dash-mounted control head.

A chrome plated bar is attached to the front panel. When the bar is pulled up and outward, it becomes a carrying handle. A key lock is also mounted on the front panel to secure the drawer assembly from unauthorized persons.

For servicing purposes, the major chassis are easily accessible by removing the drawer unit from the housing. This provides access to all components in the radio set. Refer to the SERVICE AIDS section of this manual for instructions on the removal of individual components.

9. ACCESSORY GROUPS

In addition to the basic radio set, an accessory group is required to complete the installation. Various combinations of accessories are available to meet specific requirements. The accessory groups are listed in the Accessory Group Model Chart in the front part of this manual.

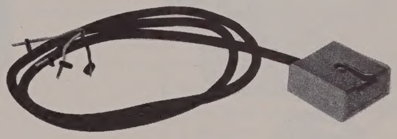
The control heads available as part of the accessory groups provide all the required control facilities for operation of the radio set. The dash-mount control heads plug directly into the front panel. Trunk-mount control heads have an adjustable angle-bracket for mounting to the vehicle dash, and are connected to the radio set via a cable kit.

The microphone used with the "Motrac" radio set is a palm-type, dynamic microphone with a transistorized pre-amplifier. The microphone has a 12 inch tinsel coiled-cord and a four-pin connector for plugging into the receptacle on the control head.

Special mounting brackets are included with all dash-mount accessory groups to mount the radio set in the passenger compartment of the vehicle. The brackets can be assembled in a number of different ways, thus providing various combinations of mounting angles and positions.

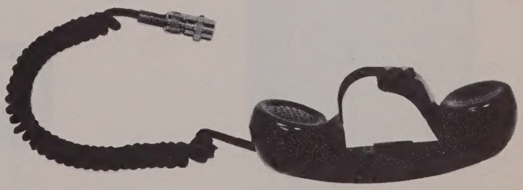
If desired, 6 volt accessories can be converted for 12 volt operation. Refer to the SERIVCE AIDS section of this manual for conversion instructions.

10. OPTIONAL ACCESSORIES



TLN6246A HANG-UP SWITCH BOX FOR DUAL SQUELCH "PRIVATE-LINE" MODELS

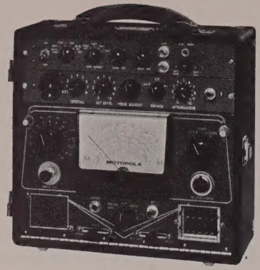
Provides automatic switching to the carrier squelch circuit when the microphone is picked up.



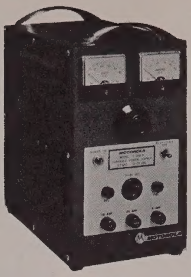
TMN6006A DYNAMIC HANDSET

The handset has a 4-pin connector for plugging directly into the control head receptacle.

RECOMMENDED TEST EQUIPMENT



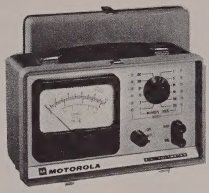
S1059A*
PORTABLE TEST SET



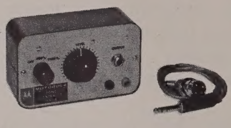
T1012A
POWER SUPPLY

P-7208
WATTMETER
DUMMY LOAD

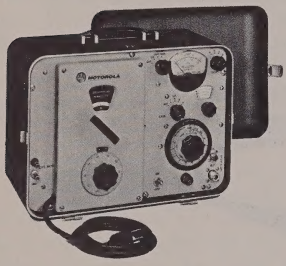
S1063A
DC MULTIMETER



S1051B
TRANSISTORIZED AC
VOLTMETER



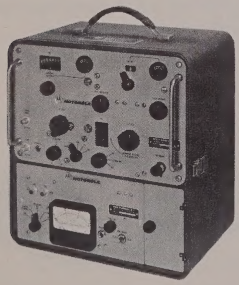
TEK-1A
TRANSISTORIZED TONE
GENERATOR



T1034B
SIGNAL GENERATOR

T1015A
GENERAL PURPOSE
OSCILLOSCOPE

T1014B
PRECISION WIDE BAND
OSCILLOSCOPE



T1020A
FREQUENCY AND
DEVIATION MONITOR

TEK-21
PULSE GENERATOR

T1100A SERIES
FM STATION MONITOR

*For use with "Motrac" radio sets, order TKN6025A Cable Adapter.

CE1260B AEPD-6933-O (MC6826) CE1630C AEPD-7846-O (MC7794) AEPD-6626-O (MC6863) AEPD-6684-O (MC5293)
CE2114 AEPD-6901-O (MC7131) AEPD-7808-O (MC7763) MC1971 MC5744 AEPD-7707-O (MC7460)

INSTALLATION AND OPERATION

1. INSTALLING THE RADIO SET

Complete installation instructions are packed in the shipping carton with the radio set. Install the radio set according to the instructions supplied.

2. OPERATING INSTRUCTIONS

CAUTION

Before operating the "Motrac" radio set make sure that the polarity and/or voltage plugs in the power supply are in the proper positions as described in the installation instructions.

TO RECEIVE

2-FREQ. MODELS ONLY	Place the F1-F2 switch in the desired position.
ALL MODELS	Place the ON-OFF switch in the ON position or turn the OFF-VOLUME control clockwise. The green lamp will go on to indicate the "standby" condition. The receiver is in full operation.

TO HEAR ALL ON-FREQUENCY SIGNALS

DUAL SQUELCH "PRIVATE-LINE" MODELS ONLY	Place the "PL" ON-OFF switch in the OFF position.
"EXTENDER" MODELS ONLY	Place the EXTEND-STD-REJECT switch in the EXTEND position.
ALL MODELS	Turn the SQUELCH control to the full counterclockwise position. Turn the VOLUME control clockwise until noise is heard. Adjust the SQUELCH control by turning it slowly clockwise until the noise is just squelched (cuts out). Set the VOLUME control to the desired listening level with a received signal.

TO HEAR ALL ON-FREQUENCY SIGNALS (CONTINUED)

"EXTENDER" MODELS ONLY	In strong signal areas where interfering signals can be present, place the EXTEND-STD-REJECT switch in the REJECT position.

TO HEAR "PRIVATE-LINE" SIGNALS ONLY

ALL DUAL SQUELCH "PRIVATE-LINE" MODELS	Place the "PL" ON-OFF switch in the ON position. Set the VOLUME control to the desired listening level with a received signal.
DUAL SQUELCH "PRIVATE-LINE" MODELS WITH "EXTENDER" OPERATION	In weak signal areas where the noise level is high, place the EXTEND-STD-REJECT switch in the EXTEND position. In strong signal areas where interfering signals can be present, place the switch in the REJECT position.

TO TRANSMIT

ALL MODELS	Proceed as previously described under "TO RECEIVE" and "TO HEAR ALL ON-FREQUENCY SIGNALS". Turn "on" the vehicle ignition switch in 12 volt systems or the transmitter filament switch in 6 volt systems and allow about 45 seconds for the transmitter tubes to warm up. For short transmissions it is not necessary to start the engine; however, to conserve the battery, the engine should be running. When the channel is clear, remove the microphone from the hang-up bracket. Hold it about one inch from the lips and turned

TO TRANSMIT (CONTINUED)

ALL MODELS	about 30° away from the face. Press the push-to-talk button. The red lamp will come on and the transmitter will go "on the air". Speak slowly and clearly across the microphone in a normal or slightly louder than normal voice. At the end of the message, release the push-to-talk button and replace the microphone in the hang-up bracket.

TO TURN OFF

ALL MODELS	Place the ON-OFF switch in the OFF position--or--turn the OFF-VOLUME control counterclockwise until a click is heard.

3. LOW CURRENT DRAIN MODIFICATION FOR 12 VOLT SYSTEMS

If desired, an additional saving in battery current drain of about 200 ma (in the standby condition) may be obtained by a wiring modification in the control head. If this modification is incorporated, the green pilot lamp will not operate until the ignition switch and the transmitter filaments are turned on. Proceed as follows to complete the modification.

a. Loosen the two mounting screws and remove the control head.

b. Remove the 33 ohm, 2 watt resistor connected between a terminal on the rear of the OFF-VOLUME control or ON-OFF switch (depending on the model) and the green pilot lamp socket.

c. Connect a 33 ohm, 2 watt resistor between the terminal with the brown lead attached to it on the red pilot lamp socket and the original connection on the green pilot lamp socket.

NOTE

No current-reduction modification can be made in 6-volt control heads.

THEORY OF OPERATION

1. ±12 VOLT FUNCTIONAL OPERATION

The overall operation of the ±12 volt radio set is illustrated in the Functional Block Diagram in figure 1A. This diagram applies to both dash mount and trunk-mount installations.

The d-c input to the radio set is controlled by the control head power on-off switch and the vehicle ignition switch. The circuit from the ungrounded side of the battery through the vehicle ignition switch to the power on-off switch is the battery saver circuit.

When the power on-off switch is on, the battery voltage is applied to the receiver through normally closed contacts of the transmit relay in the power supply. This places the receiver in "standby" operation. At this time the green lamp on the control head will be energized.

When the power on-off switch and the ignition switch are both on, the radio is in the "receive" condition.

When the ignition and control head switches are on and the microphone push-to-talk button is pressed, the transmit relay is energized. In "Private-Line" models the ground circuit to the transmit relay is completed through contacts of the squelch tail eliminator relay and both relays are energized. When the relay(s) is energized, the radio set is in the transmit condition and the following functions are performed:

a. Battery voltage is applied to the power supply transistor switching circuit.

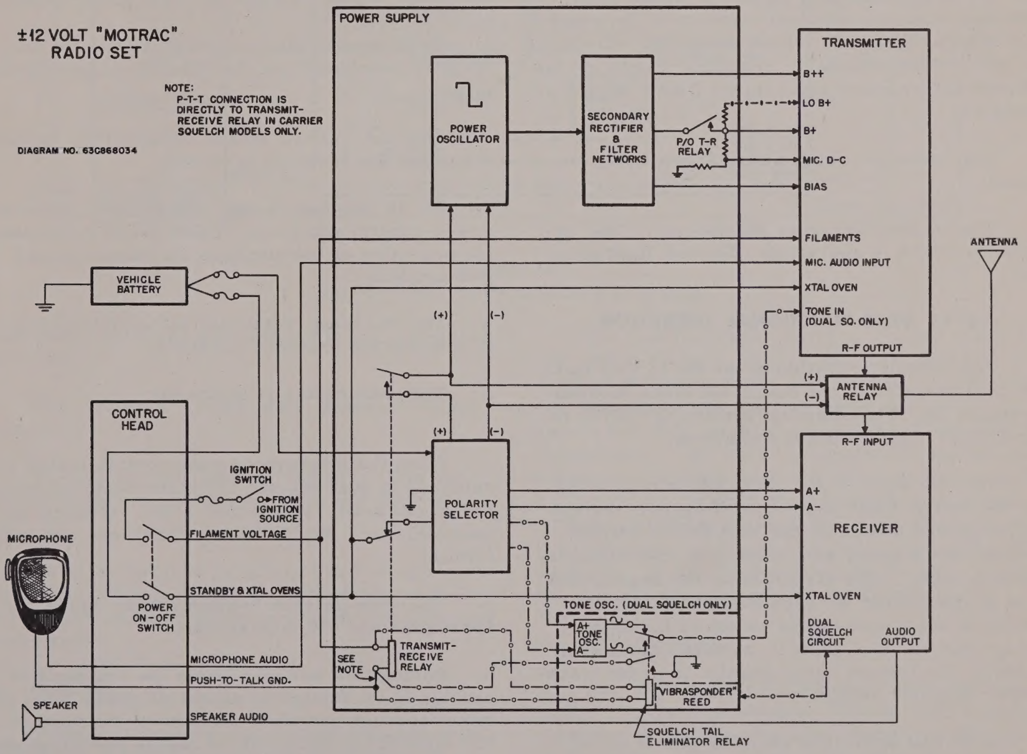

±12 VOLT "MOTRAC" RADIO SET
NOTE: P-T-T CONNECTION IS DIRECTLY TO TRANSMIT-RECEIVE RELAY IN CARRIER SQUELCH MODELS ONLY.
DIAGRAM NO. 63C868034
POWER SUPPLY
POWER OSCILLATOR
SECONDARY RECTIFIER & FILTER NETWORKS
P/O T-R RELAY
TRANSMITTER
B++
LO B+
B+
MIC. D-C
BIAS
FILAMENTS
MIC. AUDIO INPUT
XTAL OVEN
TONE IN (DUAL SQ. ONLY)
R-F OUTPUT
ANTENNA
ANTENNA RELAY
(+)
(–)
VEHICLE BATTERY
CONTROL HEAD
IGNITION SWITCH
FROM IGNITION SOURCE
FILAMENT VOLTAGE
STANDBY & XTAL OVENS
POWER ON-OFF SWITCH
MICROPHONE
MICROPHONE AUDIO
PUSH-TO-TALK GND.
SPEAKER
SPEAKER AUDIO
POLARITY SELECTOR
R-F INPUT
A+
A–
RECEIVER
XTAL OVEN
DUAL SQUELCH CIRCUIT
AUDIO OUTPUT
TONE OSC. (DUAL SQUELCH ONLY)
A+ TONE OSC. A–
TRANSMIT-RECEIVE RELAY
SEE NOTE
"VIBRASPONDER" REED
SQUELCH TAIL ELIMINATOR RELAY

Figure 1A.
±12 Volt Functional Block Diagram

b. The antenna relay is energized and the antenna is switched from the receiver to the transmitter.

c. Battery voltage is disconnected and the receiver is muted.

d. B+ is applied to the transmitter (from the power supply) and d-c is routed to the microphone for operation of the microphone transistorized pre-amplifier.

e. The red lamp on the control head is energized to indicate the transmit condition.

When the microphone push-to-talk button is released in dual squelch models, the squelch tail eliminator relay releases immediately and the following functions are performed:

f. The slow-release transmit relay holds for approximately 150 milliseconds.

g. During this period of time the transmitter carrier is modulated by an out-of-phase tone, obtained through switched contacts of the squelch tail eliminator relay, which damps the vibrations of the "Vibrasponder" resonant reed in the "listening" receiver and returns it to a squelched condition.

h. The transmit relay and antenna relay release.

i. The transmitter goes off the air. The receiver is back in operation. The red light goes out.

2. ±6/12 VOLT FUNCTIONAL OPERATION

The overall operation of the ±6/12 volt radio set is illustrated in the functional block diagram in figure 1B. This diagram applies to both dash-mount and trunk-mount installations.

The d-c input to the radio set is controlled by the control head power on-off switch, the vehicle ignition switch or the TRANS FILAMENT switch, and a heavy duty contact on the transmit-receive relay. The circuit from the ungrounded side of the battery through the vehicle ignition switch to the power on-off switch is the battery saver circuit for 12-volt models. On 6-volt models, the battery saver feature is in the transmitter filament switch.

In 12 volt operation when the power on-off switch is on, voltage is applied directly to the receiver through normally closed contacts of the transmit relay in the power supply. In 6-volt operation the power supply operates to supply voltage to the receiver through normally closed contacts of the transmit relay. This places the receiver in standby operation.

When the ignition switch or transmitter filament switch is ON and the microphone push-to-talk button is pressed, the transmit relay is energized. This places the radio set in the transmit condition. The battery saver feature completes the circuit from the ungrounded side of the battery to one side of the relay coil; the microphone button completes the ground circuit to the other side of the relay coil. In 12 volt operation a resistor is inserted in series with the 6-volt relay coil. When the relay is energized, various functions are performed as follows:

a. Battery voltage is applied through the main power cable to energize the power supply transistor switching circuit in 12 volt operation. In 6 volt operation, additional power is supplied to the power supply through the main power cable.

b. The antenna relay is energized and the antenna is switched from the receiver to the transmitter.

c. The A+ circuit to the receiver is broken; therefore the receiver is muted.

d. B+ is applied to the transmitter (from the power supply) and d-c is routed to the microphone for operation of the microphone transistorized pre-amplifier.

e. The red lamp on the control head is energized to indicate the transmit condition.

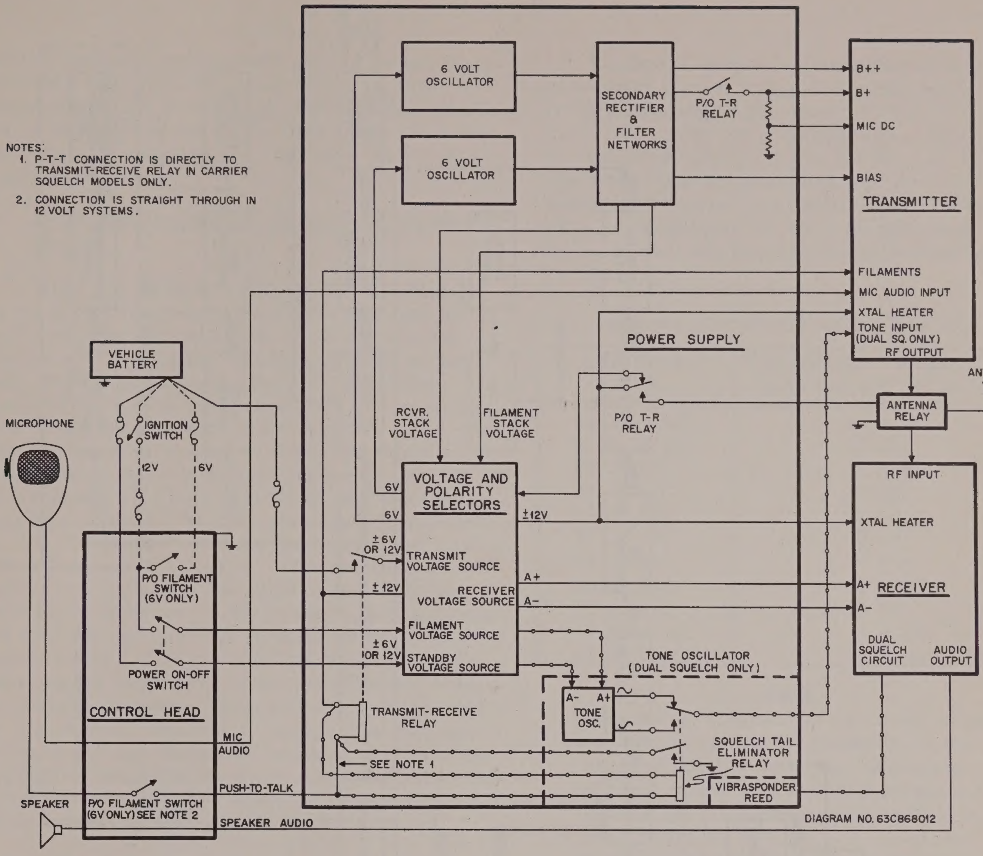
f. The transmitter is on the air.

When the microphone push-to-talk button is released in dual squelch "Private-Line" models, the squelch tail eliminator relay releases immediately and the following functions are performed:

g. The slow-release transmit relay holds for approximately 150 milliseconds.

h. During this period of time the transmitter carrier is modulated by an out-of-phase tone, obtained through switched contacts of the squelch tail eliminator relay, which damps the vibrations of the "Vibrasponder" resonant reed in the

63C868012-D


6 VOLT OSCILLATOR
6 VOLT OSCILLATOR
SECONDARY RECTIFIER & FILTER NETWORKS
P/O T-R RELAY
B++
B+
MIC DC
BIAS
TRANSMITTER
FILAMENTS
MIC AUDIO INPUT
XTAL HEATER
TONE INPUT (DUAL SQ. ONLY)
RF OUTPUT
POWER SUPPLY
ANTENNA
ANTENNA RELAY
P/O T-R RELAY
VEHICLE BATTERY
MICROPHONE
IGNITION SWITCH
12V
6V
RCVR. STACK VOLTAGE
FILAMENT STACK VOLTAGE
VOLTAGE AND POLARITY SELECTORS
6V
6V
±12V
RF INPUT
XTAL HEATER
±6V OR 12V
TRANSMIT VOLTAGE SOURCE
±12V
RECEIVER VOLTAGE SOURCE
A+
A−
A+ RECEIVER
A−
P/O FILAMENT SWITCH (6V ONLY)
FILAMENT VOLTAGE SOURCE
±6V OR 12V
STANDBY VOLTAGE SOURCE
POWER ON-OFF SWITCH
TONE OSCILLATOR (DUAL SQUELCH ONLY)
DUAL SQUELCH CIRCUIT
AUDIO OUTPUT
CONTROL HEAD
A− A+ TONE OSC.
TRANSMIT-RECEIVE RELAY
MIC AUDIO
SEE NOTE 1
SQUELCH TAIL ELIMINATOR RELAY
PUSH-TO-TALK
VIBRASPONDER REED
SPEAKER
P/O FILAMENT SWITCH (6V ONLY) SEE NOTE 2
SPEAKER AUDIO
DIAGRAM NO. 63C868012

NOTES:
1. P-T-T CONNECTION IS DIRECTLY TO TRANSMIT-RECEIVE RELAY IN CARRIER SQUELCH MODELS ONLY.
2. CONNECTION IS STRAIGHT THROUGH IN 12 VOLT SYSTEMS.

Figure 1B.
±6/12 Volt Functional Block Diagram

"listening" receiver and returns it to a squelched condition.

i. The transmit relay and antenna relay release.

j. The transmitter goes off the air. The receiver is back in operation. The red light goes out.

Refer to the schematic and block diagrams to follow the circuitry and the detailed explanation of the radio set operation covered in the following paragraphs.

3. RECEIVER

The receiver is a completely transistorized double-conversion superheterodyne type. It receives FM signals on one (or two) fixed, crystal-controlled frequencies in the 25-54 mc band.

The two-frequency receiver is the same as the one-frequency except for the addition of another first oscillator and control crystal. Only one frequency can be received at a time. A switch (F1-F2) on the control head selects the frequencies. In the F1 position, the switch completes the d-c path to A- for the transistor of the #1 oscillator, permitting that stage to operate. At the same time it opens the d-c path to A- for the transistor of the #2 oscillator, disabling the #2 stage. In the F2 position, the switch reverses the connections and selects the #2 oscillator.

a. RF Amplifier

The r-f amplifier consists of two common emitter transistor stages. The carrier signals received at the antenna are coupled to the base of the first r-f amplifier by the impedance-matching network in the input circuit. The two r-f stages of amplification create and improve sen-

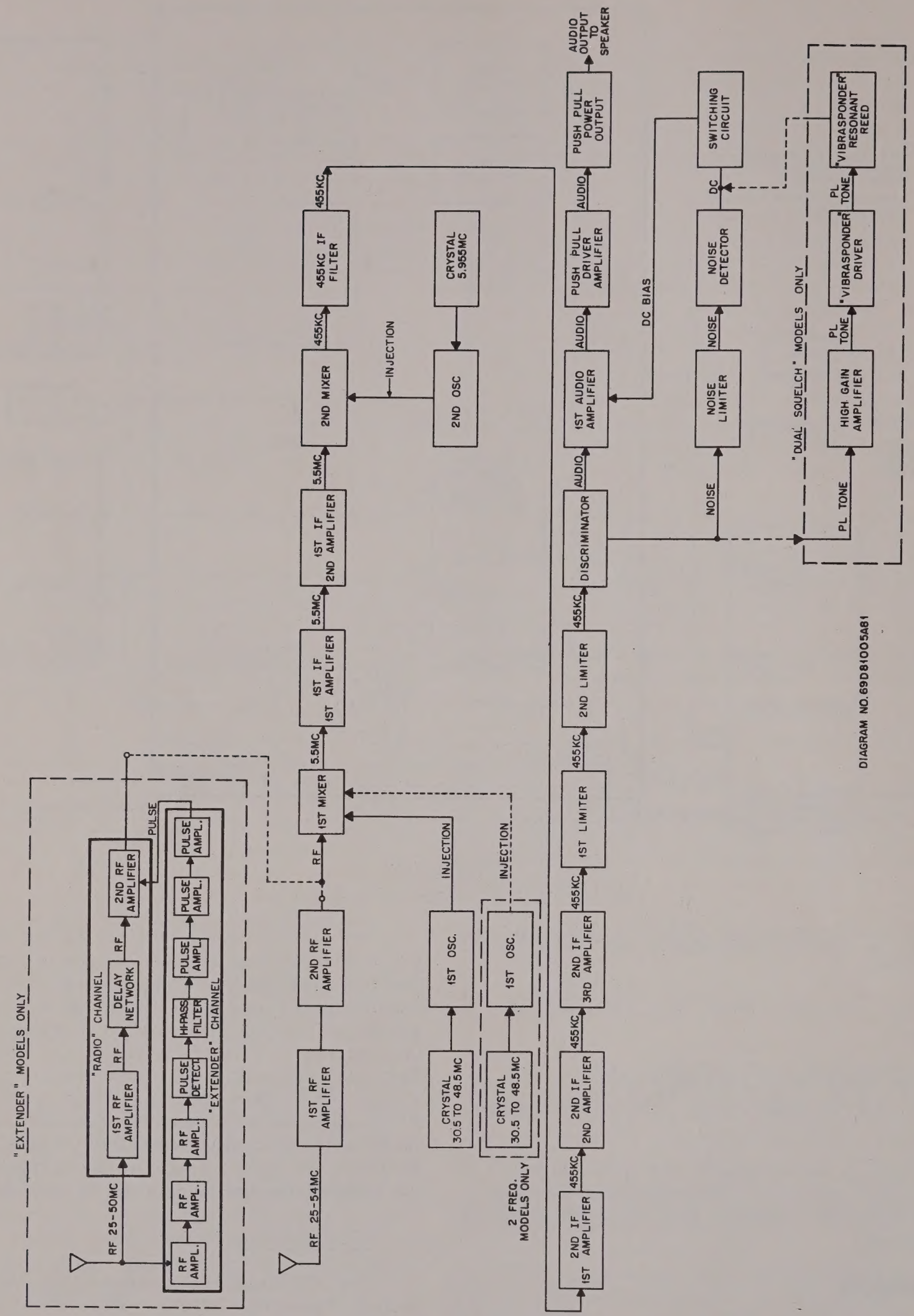

"EXTENDER" MODELS ONLY
RF 25-50MC
1ST RF AMPLIFIER
RF
"RADIO" CHANNEL
DELAY NETWORK
RF
2ND RF AMPLIFIER
PULSE
RF AMPL.
RF AMPL.
RF AMPL.
PULSE DETECT
HI-PASS FILTER
PULSE AMPL.
PULSE AMPL.
PULSE AMPL.
"EXTENDER" CHANNEL
RF 25-54MC
1ST RF AMPLIFIER
2ND RF AMPLIFIER
RF
1ST MIXER
5.5MC
1ST IF 1ST AMPLIFIER
5.5MC
1ST IF 2ND AMPLIFIER
5.5MC
2ND MIXER
455KC
455KC IF FILTER
455KC
INJECTION
2ND OSC
CRYSTAL 5.955MC
INJECTION
1ST OSC.
CRYSTAL 30.5 TO 48.5MC
INJECTION
1ST OSC.
CRYSTAL 30.5 TO 48.5MC
2 FREQ. MODELS ONLY
1ST 2ND IF AMPLIFIER
455KC
2ND 2ND IF AMPLIFIER
455KC
3RD 2ND IF AMPLIFIER
455KC
1ST LIMITER
455KC
2ND LIMITER
455KC
DISCRIMINATOR
AUDIO
1ST AUDIO AMPLIFIER
AUDIO
PUSH PULL DRIVER AMPLIFIER
AUDIO
PUSH PULL POWER OUTPUT
AUDIO OUTPUT TO SPEAKER
DC BIAS
NOISE
NOISE LIMITER
NOISE
NOISE DETECTOR
DC
SWITCHING CIRCUIT
"DUAL SQUELCH" MODELS ONLY
PL TONE
HIGH GAIN AMPLIFIER
PL TONE
"VIBRASPONDER" DRIVER
PL TONE
"VIBRASPONDER" RESONANT REED
DIAGRAM NO.69D81005A81

Figure 2.
Receiver Block Diagram

sitivity and selectivity. The gain of these stages provides the optimum signal-to-noise ratio in the signals sent to the first mixer. Selectivity is provided by use of very low-loss coils and by critically coupling both the input and output circuits.

b. Radio and "Extender" Channels in "Extender" Models

When the EXTEND-STD-REJECT switch is in the EXTEND position, the r-f signal and impulse noise bursts enter two parallel paths or channels. The "radio" channel consists of common emitter and common base r-f amplifiers tuned to the r-f carrier frequency. These stages are separated by a time delay network. The "Extender" channel consists of three r-f amplifier stages tuned to a "sampling" frequency, an AM pulse detector, a high pass filter and three pulse amplifier stages. Impulse noise bursts detected in the "Extender" channel are amplified and shaped to form bias pulses. The negative bias pulses are applied to the emitter circuit of the second r-f amplifier in the "radio" channel to cut off the transistor for the duration of the impulse noise bursts. This prevents impulse noise from entering the remainder of the receiver and being heard at the speaker. The delay line is inserted in the "radio" channel to insure that the bias pulses from the "Extender" channel arrive at the second r-f amplifier in the "radio" channel at the same time or slightly before the impulse noise bursts traveling through the "radio" channel.

In the "Extender" channel, the impulse noise bursts are amplified in three r-f amplifier stages. The output of the third r-f amplifier enters a detector which responds to amplitude variations (noise) at the "sampling" frequency.

The detector output (pulses) is coupled to the pulse amplifiers through a gate circuit consisting of two diodes. The gate circuit establishes a reference level which allows only pulses generated by impulse noise bursts to pass through to the pulse amplifiers. This prevents generation of blanking pulses by inherent receiver noise. Positive pulses arriving at the first pulse amplifier result in an increase in collector current. The rapid increase in collector current starts a ringing or flywheel effect in the output. The positive portion of the ringing alternation is removed and the negative portion is coupled to the second pulse amplifier. The pulse undergoes phase reversals in the second and third pulse amplifiers and arrives at the emitter circuit of the second r-f amplifier as a negative pulse to cut off the stage for the duration of the impulse noise burst.

The broad frequency characteristics of impulse noise permit tuning of the "Extender" channel to frequencies other than the desired r-f carrier. This does not affect operation of the "radio" or "Extender" channels and can be used to advantage when interfering signals are present. The "sampling" frequencies listed in the following table are suggested for most installations and the radio sets are tuned to these frequencies at the factory.

"SAMPLING" FREQUENCY TABLE

CARRIER FREQ.	"SAMPLING" FREQ. FOR "EXTENDER" CHANNEL
25-25.5 MC	32.5 MC
25.5-26 MC	29 MC
26-28 MC	30 MC
28-30 MC	31 MC
30-31 MC	32 MC
31-36 MC	30 MC
36-38 MC	39 MC
38-40 MC	41 MC
40-42 MC	39 MC
42-48.5 MC	49.5 MC
48.5-50 MC	47.5 MC

NOTE

"Sampling" frequencies as listed in the table are suggested. However, in the event of interference the "Extender" channel can be tuned to a clear channel without any change in performance of the "radio" or "Extender" channels. Avoid tuning the "Extender" channel to the desired r-f carrier frequency or within 2 mc of the local oscillator frequency. A small degradation in receiver sensitivity will occur due to interaction of the two antenna coils when aligned to the r-f carrier frequency. The presence of strong signals from the local oscillator can desensitize the "Extender" channel when it is aligned within 2 mc of the local oscillator frequency.

An automatic sensitivity control circuit amplifies and rectifies a portion of the output of the first 5.5 mc i-f amplifier. The d-c output of this circuit is fed back to the second r-f amplifier in the "Extender" channel as a reverse bias. Strong signals reaching the antenna (100-500 microvolts) cause the emitter-to-base voltage of the second r-f amplifier in the "Extender" channel to drop to zero. This cuts off the stage and disables the "Extender" channel.

The receiver is protected from degradation caused by "beat" frequencies or heterodyne section produced by strong signals entering the "Extender" channel. A parallel r-c network, inserted between the output of the "Extender" channel and the "radio" channel, forms a "rate-shut-off" circuit which disables the "Extender" channel when this type of interference is present. These signals are generally present intermittently and would cause a corresponding intermittent change in "Extender" performance. Elimination of this type of problem in severe cases can be accomplished by simply retuning the "Extender" channel to a clear "sampling" frequency.

The "Extender" circuit improves two-way radio communications by the elimination of interference caused by impulse noise bursts. Maximum efficiency is obtained when good vehicle maintenance practices are observed. Checks for poor connections in ignition wiring and "opens" in resistive wiring should be performed periodically.

When the EXTEND-STD-REJECT switch is in the REJECT position, negative feedback is applied to the first r-f amplifier in the "radio" channel to reduce the "front end" gain of the receiver for suppression of interfering signals.

When the EXTEND-STD-REJECT switch is in the STD position, d-c supply voltage is removed from the "Extender" channel and it becomes inoperative.

c. First Oscillator

The first oscillator stage has a high degree of stability with respect to thermal, mechanical and electrical variations. The oscillator frequency is controlled by a crystal operating at a specific frequency within the 30.500 to 48.500 mc range.

The oscillator output is coupled to the first mixer.

d. First Mixer

The first mixer heterodynes the signal from the r-f amplifier with the signals from the first oscillator to produce the first intermediate frequency (1st i-f) of 5.5 mc.

The first oscillator frequency is above the r-f carrier frequency in receivers operating between 25 and 42 mc. The first oscillator frequency is below the r-f carrier frequency in receivers operating between 42 and 54 mc. The difference frequency is equal to the first i-f 5.5 mc.

These frequency relationships are as follows:

For the 25-42 mc range:

$$\underbrace{f_o}_{\text{first oscillator frequency}} - \underbrace{f_c}_{\text{r-f carrier frequency}} = \underbrace{5.5 \text{ mc}}_{\text{first mixer output (first i-f)}}$$

For the 42-54 mc range:

$$\underbrace{f_c}_{\text{r-f carrier frequency}} - \underbrace{f_o}_{\text{1st osc. frequency}} = \underbrace{5.5 \text{ mc}}_{\text{1st mixer output (1st i-f)}}$$

e. First IF and Second Mixer

The first i-f section consists of two capacitor-tuned amplifiers and four very high Q toroidal coils with tuned circuits. Low insertion loss and very high-Q toroidals coils are used to provide high selectivity. The output from the first mixer is matched to a low-impedance coil and inductively coupled to a high-impedance coil. The high-impedance coil is capacitively-coupled to another high-impedance coil providing selectivity. The impedance is stepped-down to match the low input impedance to the base of the i-f amplifier.

The outputs of the 5.5 mc i-f amplifier and the 2nd local oscillator are applied to the 2nd mixer circuit. The crystal-controlled 2nd oscillator operates above the 1st i-f at 5.955 mc except in the case where the receiver is tuned near harmonics of this frequency. To avoid interference from these harmonics a crystal which oscillates below the 1st i-f at 5.045 mc is used when the receiver is tuned to the following frequencies:

29.77 mc
35.72 mc through 35.74 mc
41.68 mc through 41.70 mc
47.64 mc
53.58 mc through 53.61 mc

The 5.955 mc crystal is 455 kc above the 5.5 mc 1st i-f and the 5.045 mc crystal is 455 kc below it. The output of the 2nd mixer is the difference between the 2nd local oscillator and the 5.5 mc i-f. This frequency is 455 kc and is called the 2nd i-f.

f. Second IF

A "Permakay" i-f filter is used in the second i-f before the amplification stages. This filter is permanently sealed in polyesterstyrene and is unconditionally guaranteed for the life of the receiver, provided the seal is unbroken and the housing is not tampered with. This filter is the major factor in determining the bandwidth and selectivity of the receiver. It greatly attenuates the signal outside the pre-determined pass-band. Three i-f amplifier stages follow the 455 kc filter to saturate the limiter.

g. Limiter Stage

The two limiter stages are 455 kc amplifiers arranged so that an increase in input signal produces no change in the amplitude of the output signal. Operation of the limiter depends upon the application of a large amplitude signal. The limiters are in full saturation at all times, that is, with weak or strong signals or noise only.

When a signal is applied to the NPN first limiter, the base is driven negative with respect to the emitter during the negative alternation of the signal. This places a reverse bias at the emitter-base junction causing the collector current to drop to zero. During the positive half of the input signal, the base becomes more positive, increasing the emitter-to-collector current to its maximum value. Thus with a signal, the collector current is driven to cut-off and maximum. Operation of the second limiter is essentially the same except that the signal undergoes a phase reversal in the first limiter and the PNP transistor performs the same functions when its input signal is of opposite polarity. The output of the limiters is a signal of constant amplitude.

h. Discriminator

The discriminator used is a phase discriminator, that is, the operation is dependent upon a 90° phase shift which occurs at resonance between the primary and secondary voltages of the tuned transformer.

The discriminator recovers the audio from the 455 kc i-f signal. A typical discriminator response curve is shown in figure 3.

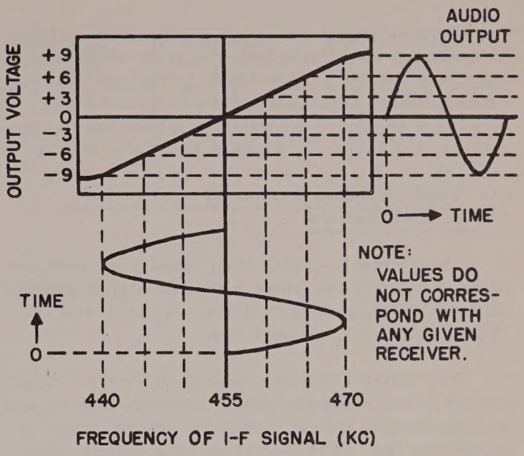


Figure 3.
Typical Discriminator Response

The i-f signal varies in frequency at the audio rate. This is shown below the curve. The corresponding audio output is drawn to the right of the curve.

i. Noise-Actuated Squelch Circuit

The purpose of the squelch circuit is to eliminate disturbing noise which would otherwise be heard at the speaker during intervals between received messages.

The noise-actuated squelch circuit consists of a noise limiter, noise detector (rectifier) and transistorized d-c control stage (switching circuit).

In the absence of a received r-f carrier (SQUELCH control at threshold), noise from the discriminator is amplified by the noise amplifier limiter. This noise voltage is rectified in the form of drawing more or less current in the noise detector stage. More current is drawn when the receiver is fully squelched (SQUELCH control fully clockwise); less current is drawn when the receiver is in the unsquelched condition.

When the noise detector is drawing heavy current, a less positive voltage is developed at the emitter element of the detector. This causes a heavy forward bias to be applied to the switching transistor which results in a heavy current through the transistor. This in turn reverse biases the first audio amplifier stage cutting off the stage. Therefore, the following audio stages do not receive signals and the speaker is quiet.

When an on-frequency signal is received, the noise reaching the squelch circuit diminishes entirely, so that there is little or no output from the noise detector. As a result, the d-c control stage appears as an open switch and the audio amplifier is biased normally. Under these conditions, the incoming signals reach the speaker.

j. Tone-Actuated Squelch Circuit in Dual Squelch Models

The "Private-Line" (PL) squelch circuit consists of a low-pass filter network, high-gain amplifier, "Vibrasponder" driver-limiter and a "Vibrasponder" resonant reed.

The output from the discriminator is connected to the low-pass filter network, which passes frequencies below the audio range, that is, below 300 cps. The low-frequency signals (PL tone) are amplified and coupled to the input of the "Vibrasponder" driver. The driver stage provides the output required for driving the resonant reed. Thus, in "Private-Line" operation the r-f carrier is always modulated by the assigned, PL tone, which after being detected and amplified, energizes the resonant reed. If a different tone is present with the r-f carrier, the reed will not respond due to its highly selective design. The driver output is applied to the resonant reed coil through a capacitor to complete the PL tone path. The resonant reed is permanently tuned and sealed at the factory. The reed vibrates in response to the incoming tone signal from the transmitter. The vibrating reed makes intermittent contact with a fixed point on the mechanism framework. A capacitor in the resonant reed output gives a time constant sufficient to provide a steady d-c voltage for biasing the switching transistor. The low-pass filter is paralleled by a high-pass circuit to prevent erratic action of the "Vibrasponder" resonant reed circuit caused by noise. When the proper tone signal is received and the audio amplifier is "turned on", the high-pass path is shorted to A- through a diode that is forward biased by current flow in the audio amplifier.

k. Switching Transistor Stage

The base of the switching transistor is the control point of the entire squelch circuit. The output of the noise squelch circuit (and the output of the PL squelch circuit in dual squelch models) is connected to this point.

In dual squelch models with the PL switch ON, the noise squelch circuit is disconnected from the discriminator output and forward bias is applied to the switching transistor. Thus, only the PL squelch circuit is usable. When the PL squelch circuit output is applied to the base of the switching transistor, the transistor is biased to cut-off and appears as an open switch. Under open switch conditions, less current is drawn through the emitter resistor of the switching transistor and the first audio amplifier is biased normally, allowing the incoming signals to reach the speaker.

In dual squelch models with the PL switch in the OFF position or in carrier squelch models, the discriminator noise output is connected to the input of the noise-squelch circuit, through the SQUELCH control on the control head, and the fixed forward bias is removed. Under these conditions, the noise-squelch circuit output is applied to the base of the switching transistor, biasing it into conduction. Therefore, any carrier (modulated or unmodulated) will activate the noise-squelch circuit and pass the signals on to the speaker.

In dual squelch models the PL squelch circuit is operative at all times. The PL switch on the control head actually switches the noise-squelch circuit in or out.

l. Audio Circuit

Audio signals from the discriminator are coupled to the first audio stage through the VOLUME control (located on the control head). The VOLUME control varies the signal level applied to the base of the first audio amplifier. The audio signals are amplified in the push-pull driver amplifier stage and further amplified in the push-pull power output stage. The output stage provides a 5 watt output to a 3 ohm speaker with less than 10% distortion. Response is within +1, -8 db of the 6 db per octave de-emphasis characteristic between 300 and 3000 cps.

4. TRANSMITTER

The transmitter is phase-modulated and operates on crystal-controlled frequencies within the 25-54 mc band. The power output is 30, 50, or 100 watts depending upon the radio model. The transmitter consists of a crystal-controlled oscillator (two oscillators in two-frequency models), a phase-modulator, three stages of frequency multiplication and a final amplifier stage. The fundamental crystal frequency is multiplied 12 times to provide the final r-f amplifier output frequency.

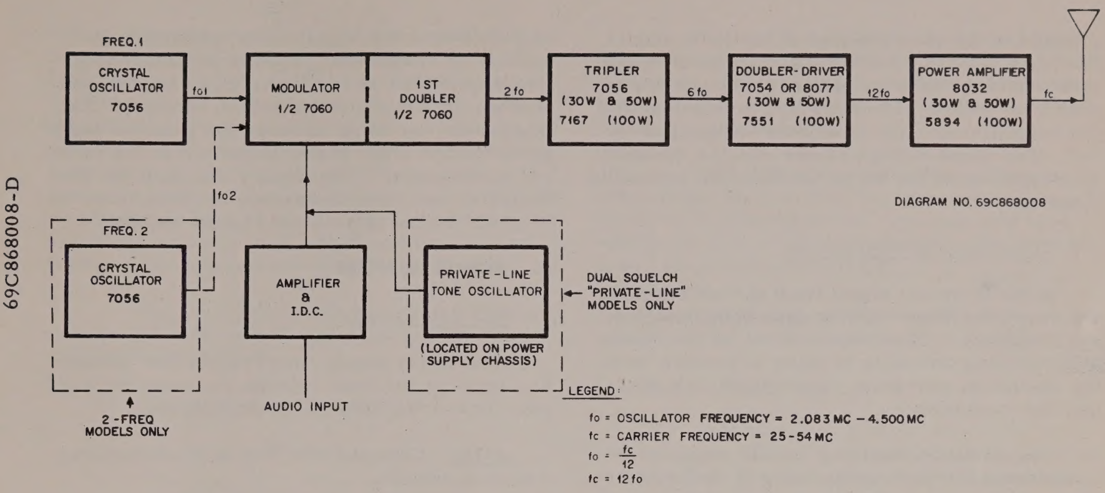

69C868008-D
FREQ. 1
CRYSTAL OSCILLATOR 7056
fo1
MODULATOR 1/2 7060
1ST DOUBLER 1/2 7060
2fo
TRIPLER 7056 (30W & 50W) 7167 (100W)
6fo
DOUBLER-DRIVER 7054 OR 8077 (30W & 50W) 7551 (100W)
12fo
POWER AMPLIFIER 8032 (30W & 50W) 5894 (100W)
fc
fo2
FREQ. 2
CRYSTAL OSCILLATOR 7056
2-FREQ MODELS ONLY
AMPLIFIER & I.D.C.
AUDIO INPUT
PRIVATE-LINE TONE OSCILLATOR
(LOCATED ON POWER SUPPLY CHASSIS)
DUAL SQUELCH "PRIVATE-LINE" MODELS ONLY
DIAGRAM NO. 69C868008
LEGEND:
fo = OSCILLATOR FREQUENCY = 2.083 MC – 4.500 MC
fc = CARRIER FREQUENCY = 25-54 MC
fo = fc/12
fc = 12 fo

Figure 4.
Transmitter Block Diagram

The transmitter block diagram, figure 4, shows the stage-by-stage signal flow and operating frequencies.

a. Tone Generator In Dual Squelch Models

The tone generator consists essentially of a transistorized oscillator, a Motorola "Vibrasender" resonant reed, a squelch tail eliminator relay and filtering networks.

The frequency of the oscillator is the "Private-Line" tone, controlled by the "Vibrasender" resonant reed. The resonant reed is the mechanical equivalent of a parallel-tuned LC circuit.

Oscillation begins when the radio set is turned on. The tone output is connected through relay contacts to the transmitter modulator. The tone modulates the transmitter and is superimposed on the r-f carrier for the duration of each transmission.

Two 180° out-of-phase outputs are available as determined by the position of the relay contacts. When the relay is de-energized, an approximate 180° out-of-phase tone is transmitted to the "Listening" receiver. The phase reversal occurs at the center-tapped transformer, where the switched outputs are about 180° out-of-phase with each other. The out-of-phase tone quickly damps the vibrations of the "Vibrasponder" resonant reed in the receiver and turns off the receiver audio before the transmitter goes off the air. The slow-release relay in the power supply, provides the delay between the time the squelch tail eliminator relay releases and the time the transmitter goes off the air. This switching of tone outputs eliminates the short burst of FM noise which would otherwise be heard in the receiver at the end of each transmission. Cause of the short noise burst is this: Receivers in the "Private-Line" system have a Motorola "Vibrasponder" resonant reed (at the same frequency as the transmitter "Vibrasender" resonant reed) in the squelch circuit. The "Vibrasponder" resonant reed vibrates in response to the transmitter "Private-Line" tone signal and the message is heard. Due to its high Q, the "Vibrasponder" resonant reed continues to vibrate for a finite time after the transmitted signal ceases. During this time the receiver is unsquelched and there is no transmitter carrier to provide receiver quieting. A burst of FM noise, called "squelch tail" would be heard at this time if the squelch tail eliminator was not used.

b. Microphone and Pre-amplifier Circuit

A Motorola dynamic microphone with a built-in transistorized pre-amplifier is usually used with this transmitter. The microphone is connected into the radio set control head; the circuit from the control head is connected to the transmitter. The microphone connects between ground and the shielded lead of the audio amplifier input circuit. A d-c voltage on the shielded lead provides operating power for the transistorized microphone. The microphone cartridge and pre-amplifier act like a variable voltage generator. The output voltage varies with the intensity and frequency of the sound waves which strike the diaphragm.

c. Deviation Limiting Circuit

In the incoming signal from the microphone, the wavefront slope depends upon both amplitude and frequency. The overall effect of the deviation limiting circuit is to place a barrier upon the maximum wavefront slope which can pass into the modulator.

The deviation limiting circuit consists of components for pre-emphasizing (6 db/octave characteristic), amplifying and limiting, and then de-emphasizing the modulation signal. The amplifier stage clips both positive and negative peaks when they exceed the pre-determined clipping level. The audio wave passes through a low-pass filter to the IDC ("Instantaneous Deviation Control") control. Except for slope limiting, the output waveform of the deviation limiting circuit is identical to the input waveform. The amplifier and deviation limiting circuit limits deviation by controlling the maximum slope of the signal wavefront which reaches the modulator. This controls transmitter maximum deviation, since the modulator frequency shift is proportional to the slope of the audio input.

d. Oscillator and Modulator

The crystal oscillator generates a specific frequency in the 2.083 to 4.500 mc range. The exact frequency depends upon the assigned i-f carrier frequency as determined by the crystal. One-frequency models have one oscillator stage, the cathode of which is grounded directly. Two-frequency models have two oscillators. The cathodes are grounded through decoupling networks, one at a time, by the F1-F2 switch on the radio set control head. Only the grounded stage is in use; the open stage is unused at the time.

The oscillator and audio-IDC outputs are applied to the phase modulator, so that deviation varies with frequency and amplitude of the modulating signal.

e. Multipliers and PA

The modulator output is applied to the doubler where the signals are amplified and doubled in frequency. They are further amplified and tripled in frequency in the tripler and doubled once more in the doubler-driver. The doubler-driver stage develops the required signal power to drive the power amplifier to its rated r-f power output. The signals reaching the final amplifier have been multiplied 12 times from the original frequency generated by the oscillator.

5. POWER SUPPLIES

a. ±12 Volt Models

The power supply converts the low voltage d-c input to the high voltage d-c required for operation of the transmitter as follows:

First. Changing d-c into a-c---transistor switching circuit.

Second. Stepping up the voltage of the a-c ---power transformer.

Third. Converting the high-voltage a-c into d-c---rectifier filter networks.

NOTE

These power supplies will operate from a positive or negative ground 12 v d-c source. Refer to the installation instructions for proper positioning of the polarity plug.

(1) Transistor Switching Circuit

When the transmit relay is energized, A+ is applied through a pi filter to the emitters of all power transistors. The input voltage is across these banks of transistors and their associated half of the transformer primary winding to A-.

The transistor switching circuit oscillator consists of two parallel transistor banks. The bases of each bank of transistors are connected to the feedback bias circuit. One bank of transistors always conducts more than the other bank when the input voltage is first applied. The polarity of the voltage induced in the feedback winding is such that the bank of transistors which begins to conduct more than the other bank is quickly driven to full conduction. The other bank is quickly cut off. Current flows through the conducting bank of transistors and their associated half of the transformer primary winding until the transformer core is saturated, at which time the voltage induced in the feedback winding reverses in polarity. The cut-off bank of transistors is quickly driven to conduction through its associated half of the transformer primary winding; the first conducting bank of transistors is quickly driven to cut-off. Conduction continues until the transformer core is saturated again. Then the cycle is reversed and repeated. This causes current to flow alternately in opposite directions through the two half-windings of the primary. The circuit is designed for continuous, self-sustaining oscillation as long as the d-c input is applied. The switching action is very rapid and the induced voltages approximate an ideal "square wave".

The secondary windings of the transformer provide the various voltages required for operation of the transmitter.

(2) Functions of Components

(a) Starting Circuit

The starting circuit consists of two resistors and a capacitor. A small amount of forward bias is applied to both banks of transistors by the capacitor. This forward bias starts the transistor conduction. Since there is never equal conduction in all transistors, one bank will conduct more than the other. The heavier conducting bank is driven to saturation and the other bank is quickly driven to cut-off.

(b) Feedback Circuit

The feedback circuit consists of the transformer feedback winding, a resistor and the base to emitter junction of the transistors. This circuit is a closed loop within the oscillator. The resistor determines the amount of drive current fed back from the bases of the transistors. It also determines the maximum power which can be drawn from the secondaries of the transformer.

(3) Transmitter Section

The transmitter B+ rectifier-filter network converts the high-voltage a-c induced in the transformer secondary to the ripple free d-c output required for the transmitter. The network consists of two full-wave bridge rectifiers and filtering circuits.

Transmitter B+ is supplied from the output of the bridge rectifier. The high-voltage a-c is connected to opposite corners of the bridge circuit. The filter network smooths out the voltage ripple. The output of this section is routed to the transmitter through a set of contacts of the transmit relay when it is energized.

Transmitter high B++ is supplied from the output of a bridge rectifier which is added to (placed in series with) the output of another bridge rectifier. The high B++ output is routed directly to the transmitter.

The transmitter bias network includes a low-voltage secondary of the transformer, a rectifier and a filter network. The negative bias voltage is applied to the transmitter driver and power amplifier grid circuits.

Microphone voltage is taken from a voltage divider in the transmitter B+ circuit.

b. ±6/12 Volt Models

In 12 volt operation, the power supply converts the low voltage d-c input to the high voltage d-c required for operation of the transmitter. Transmitter filament, receiver operating, and crystal oven voltages are supplied directly from the battery through the voltage and polarity plugs. The power supply does not operate until the radio set is in the transmit condition.

In 6 volt operation the power supply adds (places in series with) an additional voltage to the battery voltage to supply transmitter filament, receiver operating, and crystal oven voltages in addition to providing the high d-c voltages necessary for operation of the transmitter.

Conversion of the low voltage d-c input to the high d-c output for operation of the transmitter is accomplished as follows:

First. Changing d-c into a-c---transistor switching circuit.

Second. Stepping up the a-c voltage---power transformer.

Third. Converting the high voltage a-c into d-c---rectifier and filter networks.

(1) Transistor Switching Circuit

(a) 6 Volt Operation

Two 6-volt switching circuits (oscillators), consisting of four transistors each, are connected in parallel. A+ is applied to the emitters of all power transistors. A- is applied to the center taps of each of the primary windings and through each half of these windings to the collectors of an associated pair of transistors.

Proper polarity and voltage is maintained by routing through the voltage and polarity plugs.

The base elements of each pair of transistors are connected to the feedback winding associated with each bank of transistors. All of the transistors begin to conduct as A+ is applied. One pair of transistors in each bank will conduct more than its associated pair due to difference in beta and leakage. As this occurs, a voltage is induced in the associated feedback winding. The polarity of this voltage is such that the pair of heavier conducting transistors in each bank will quickly be driven to full conduction. The remaining pair in each bank is quickly cut off.

Current flows through the conducting pairs of transistors in each bank and the associated half of each primary winding until the transformer core becomes saturated. At this time the loop gain of the oscillator is reduced to less than unity and the energy stored in the field of the power transformer collapses, inducing a voltage of opposite polarity across the windings.

The cut off pairs of transistors in each bank are quickly driven to conduction through associated halves of the primary windings. The first conducting pairs in each bank are quickly cut off. Conduction through the second pair in each bank continues until the transformer core is saturated again. The second pair is then cut off and the cycle repeats.

Current flows alternately and in opposite directions through one half and then the other of each primary winding. The oscillations are self sustaining as long as the d-c input is applied. The switching action is very rapid and with the aid of wave shaping components the induced voltage approximates the ideal "square wave" pattern.

(b) 12 Volt Operation

In 12-volt operation, the two 6-volt switching circuits are connected in series. Switching action begins oscillation when the push-to-talk button on the microphone is pressed applying A+ voltage to the emitters of the transmitters through a pair of contacts closed by operation of the transmit-receive relay K201. The switching action is similar to that in 6 volt operation with the exception that current flow in each circuit is through two parallel pairs of transistors in series with one half of each of the primary windings.

(2) Functions of Components

(a) Starting Circuits

Starting of the switching action in 6 volt standby operation is accomplished by a voltage divider in the base circuit in each bank of transistors. This applies a small amount of forward bias to the base elements of the transistors, which start conducting and initiate the switching action.

In 12 volt operation the power supply does not operate until the push-to-talk button is pressed (transmit condition). Starting action is similar to the 6 volt condition with the exception that forward bias is applied to the bases of the transistors by the charging of capacitors in the base circuit.

(b) Feedback Circuits

The feedback circuits consist of the transformer feedback windings, resistors connected between the emitters and the center tap of the feedback windings, and the base to emitter junction of the transistors. The resistors determine the amount of drive current fed back to the base elements of the transistors and also the maximum power which can be drawn from the secondaries of the transformer. Additional resistors are paralleled in 6-volt operation to provide the necessary drive current.

(3) Rectifier and Filter Networks

(a) Transmitter B+

The transmitter B+ rectifier-filter network converts the high voltage a-c induced in the transformer secondary to the ripple free d-c output required for the transmitter. The network consists of a full-wave bridge rectifier and filtering circuit. The complete winding connects high voltage a-c to opposite corners of the bridge circuit in 6 volt operation. A tap on the winding provides a connection for 12 volt operation. The filter network smooths out the ripple in voltage and current. The output of this section is routed to the transmitter through a set of contacts on the transmit-receive relay when the relay is energized.

(b) Transmitter B++

Transmitter high B++ is supplied from the output of another high voltage winding and the bridge rectifier, which is added to (placed in series with) the output of the B+ bridge rectifier which supplies B+. The high B++ is filtered and routed directly to the transmitter. A tap on the winding is used for 12 volt operation.

CAUTION

> In 6 volt standby operation, the power supply is operating and a voltage is present at the transmitter power amplifier and driver tube plates.

(c) Transmitter Bias

The transmitter bias network includes a low-voltage secondary of the transformer, a rectifier, and a filter network. The negative bias voltage is applied to the transmitter power amplifier grid circuit.

(d) Receiver, Crystal Ovens and Transmitter Filaments

Two full-wave diode rectifier circuits are connected to low-voltage secondaries of the transformer to provide d-c operating voltages for the receiver crystal ovens and the transmitter filaments in 6 volt operation. The filtered output is added to (placed in series with) the d-c input through the voltage and polarity plugs.

Microphone voltage is taken from the voltage divider in the transmitter B+ circuit.

(4) Reverse Polarity and Improper Voltage Protection

The radio set is protected against accidental application of reverse polarity input voltages. If a reverse polarity input is applied in the 6-volt standby, 6-volt transmit or 12-volt transmit conditions, a high current will flow through the diodes connected between the associated primary and feedback winding center taps. The fuses in the feedback center tap lead will open. This removes the bias from the transistors and reduces current through them to a safe level. In the 6-volt conditions, both fuses will open. In the 12-volt condition, only one fuse will open. The remaining fuse should be replaced due to possible fatigue. In the 12-volt standby condition, a high current will flow through a diode in the receiver, opening a fuse in the power supply---thereby protecting the receiver.

Fuses in the cable kits provide protection against accidental application of 12-volts when the unit has been arranged for 6-volt operation.

SERVICE AIDS

Complete removal of the printed circuit boards for access to components is not always necessary. The audio board may be folded out after removal of the mounting screws.

NOTE

In "Extender" models it is necessary to remove the mounting screws and fold out the "Extender" board before folding out the audio board (Figure 5.).

Components on the transmitter/exciter board are accessible as mounted. The relay and capacitor deck folds out of the power supply. The remainder of the printed circuit boards in the receiver may be partially disconnected and folded out.

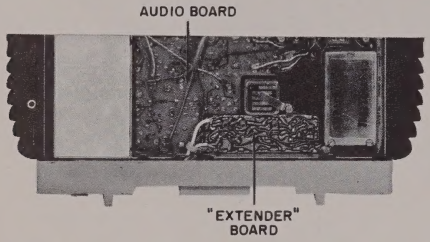


Figure 5.

AEPD-6387-O(CE2171B)

The following steps outline procedures to prepare various parts of the radio set for servicing. Observe standard servicing practices such as tagging of leads and identification of connecting points. Refer to the SERVICE DIAGRAMS booklet for lead identification and routing.

NOTE

The letters and numbers that appear in the boxes near the photographs, indicate corresponding steps in the following paragraphs. Example: a.(1) in Figure 6 indicates the location of items discussed in sub-paragraph "a.(1)".

1. RECEIVER

a. 5.5 MC Board (Figure 6)

(1) Unsolder leads to r-f deck and oscillator coupling capacitor.

(2) Unsolder filter lead.

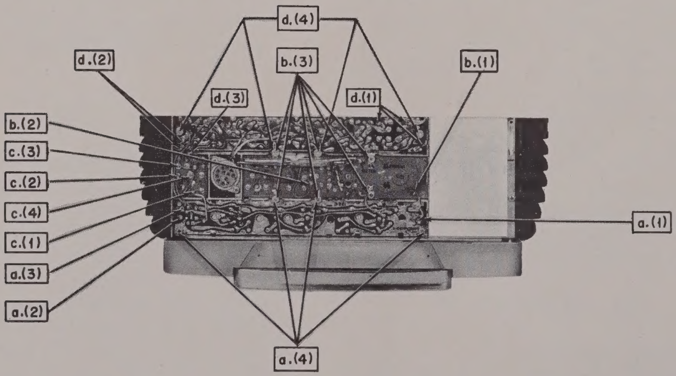


Figure 6.

AEPD-6388-O(CE2171A)

(3) Unsolder filter A- lead.

(4) Remove four mounting screws and fold out board.

b. 1st Oscillator Board (Figure 6)

(1) Unsolder coupling capacitor to 5.5 mc board (yel slv).

(2) Unsolder A- lead to 5.5 mc board (gray).

(3) Remove crystal and six mounting screws.

(4) Fold out board.

c. 2nd Oscillator Board (Figure 6)

(1) Unsolder injection lead to 5.5 mc board (yel).

(2) Unsolder A+ lead to 5.5 mc board (brn red).

(3) Unsolder A- lead (gray).

(4) Unsolder ground leads.

(5) Remove mounting screw and fold out board.

d. 455 KC Board (Figure 6)

(1) Unsolder discriminator lead (grn wht) and meter leads (wht grn and wht yel).

(2) Unsolder the two filter leads.

(3) Unsolder ground lead (bare).

(4) Remove four mounting screws and fold out board.

2. **TRANSMITTER** (30-50 WATTS)

a. Doubler Driver and Power Amplifier Tubes (Figure 7)

(1) Doubler Driver

(a) Loosen four captive screws and remove rear heat sink.

(b) Remove tube.

(2) Power Amplifier

(a) Loosen four captive screws and remove rear heat sink.

(b) Remove plate cap connector.

(c) Release hold down spring and remove tube.

b. Access to Bottom of Exciter Board (Figure 8)

Loosen three screws and slide exciter bottom cover out in direction of power supply.

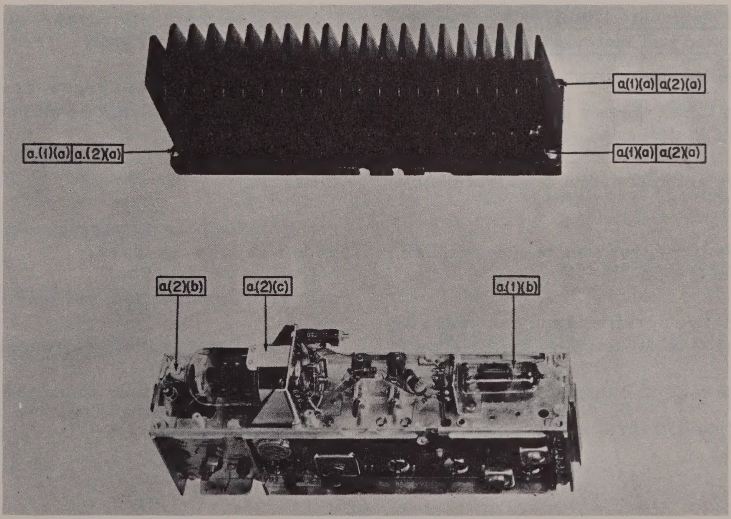


Figure 7.

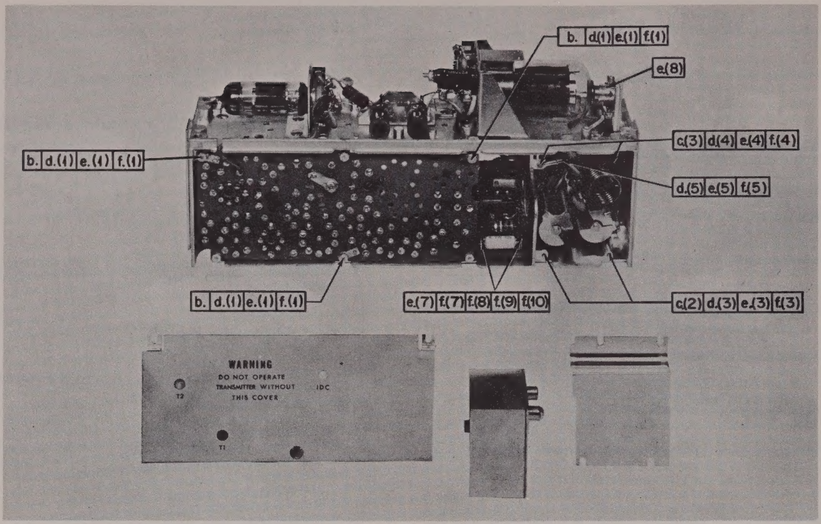


Figure 8.

c. Access to Bottom of Power Amplifier Section (Figure 8)

(1) Remove antenna output lead from harmonic filter.

(2) Remove two screws in power amplifier cover near power supply.

(3) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

d. Removal of Harmonic Filter or Access to Resistor Board and Metering Socket (Figures 8 & 9)

(1) Loosen three screws and slide exciter bottom cover out in direction of power supply.

(2) Remove antenna output lead from harmonic filter.

(3) Remove two screws in power amplifier cover near power supply.

(4) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

(5) Remove lead to output coupling coil from filter.

(6) Remove filter mounting screw from opposite side and drop out filter. (Figure 9).

e. Removal of Power Amplifier Deck (Figures 8 & 9)

(1) Loosen three screws and slide exciter bottom cover out in direction of power supply.

(2) Remove antenna output lead from harmonic filter.

(3) Remove two screws in power amplifier cover near power supply.

(4) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

(5) Remove lead to output coupling coil from filter.

(6) Remove mounting screw from opposite side and drop out filter.

(7) Unsolder blu-red lead.

(8) Remove plate cap connector.

(9) Remove four mounting screws and lift out deck.

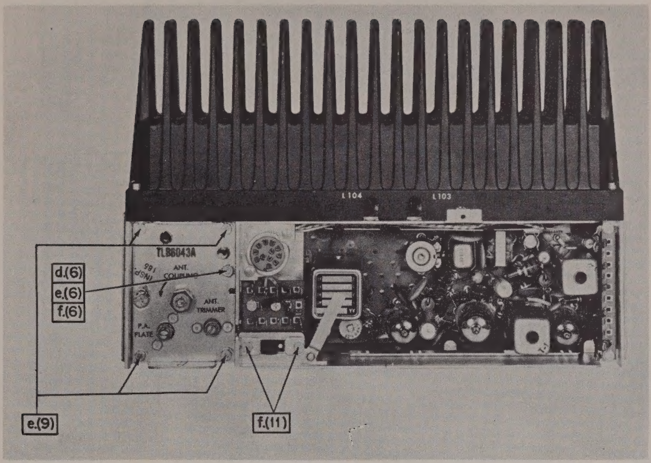


Figure 9.

f. Removal of Resistor Board and Hi-Lo Switch (Figures 8 & 9)

(1) Loosen three screws and slide exciter bottom cover out in direction of power supply.

(2) Remove antenna output lead from harmonic filter.

(3) Remove two screws in power amplifier cover near power supply.

(4) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

(5) Remove lead to output coupling coil from filter.

(6) Remove mounting screw from opposite side and drop out filter.

(7) Unsolder blu-red and red-wht leads.

(8) Unsolder red-wht lead.

(9) Unsolder orange lead.

(10) Unsolder red-blu lead.

(11) Remove two mounting screws (Hi-Lo switch) and remove resistor board and switch.

3. **TRANSMITTER** (100 WATTS)

a. Doubler Driver and Power Amplifier Tubes (Figure 10)

(1) Doubler Driver

(a) Loosen four captive screws and remove rear heat sink.

(b) Remove tubes.

(2) Power Amplifier

(a) Loosen four captive screws and remove rear heat sink.

(b) Remove two nuts, loosen two set screws in heat dissipating plate connector and remove connectors. An Allen wrench (Part No. 66A106513) is clipped to the transmitter for removing the nuts.

(c) Rotate heat dissipating shield to clear springs from support bracket.

(d) Depress hold down clip and remove tube with shield in place.

b. Access to Bottom of Exciter Board (Figure 11)

Loosen three screws and slide exciter bottom cover out in direction of power supply.

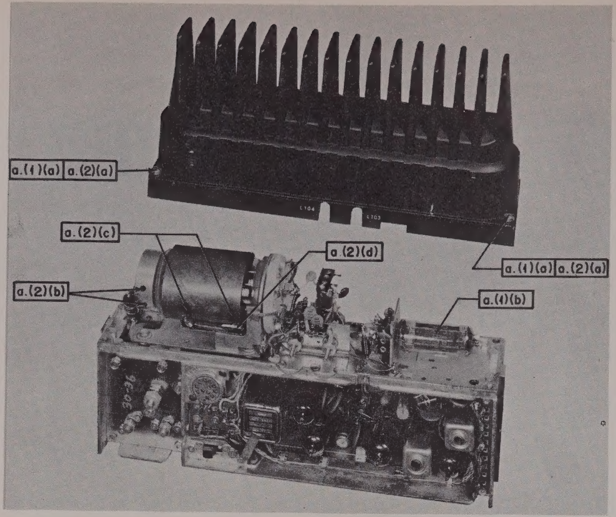

a.(1)(a) a.(2)(a)
a.(2)(c)
a.(2)(d)
a.(2)(b)
a.(1)(a) a.(2)(a)
a.(1)(b)
L104
L103

Figure 10.

AEPD-5316-B (MC6026)

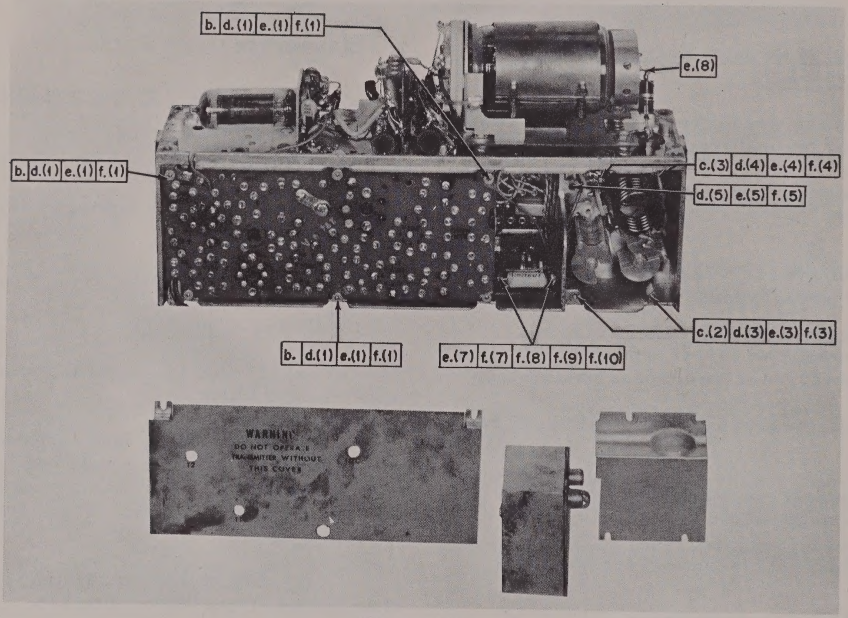

b. d.(1) e.(1) f.(1)
e.(8)
b. d.(1) e.(1) f.(1)
c.(3) d.(4) e.(4) f.(4)
d.(5) e.(5) f.(5)
c.(2) d.(3) e.(3) f.(3)
b. d.(1) e.(1) f.(1)
e.(7) f.(7) f.(8) f.(9) f.(10)
WARNING
DO NOT OPERATE
TRANSMITTER WITHOUT
THIS COVER

Figure 11.

AEPD-5317-B (MC6019)

c. Access to Bottom of Power Amplifier Section (Figure 11)

(1) Remove antenna output lead from harmonic filter.

(2) Remove two screws in power amplifier cover near power supply.

(3) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

d. Removal of Harmonic Filter or Access to Resistor Board and Metering Socket (Figures 11 & 12)

(1) Loosen three screws and slide exciter bottom cover out in direction of power supply.

(2) Remove antenna output lead from harmonic filter.

(3) Remove two screws in power amplifier cover near power supply.

(4) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

(5) Remove lead to output coupling coil from filter.

(6) Remove mounting screw from opposite side and drop out filter.

f. Removal of Resistor Board and Hi-Lo Switch (Figures 11 & 12)

(1) Loosen three screws and slide exciter bottom cover out in direction of power supply.

(2) Remove antenna output lead from harmonic filter.

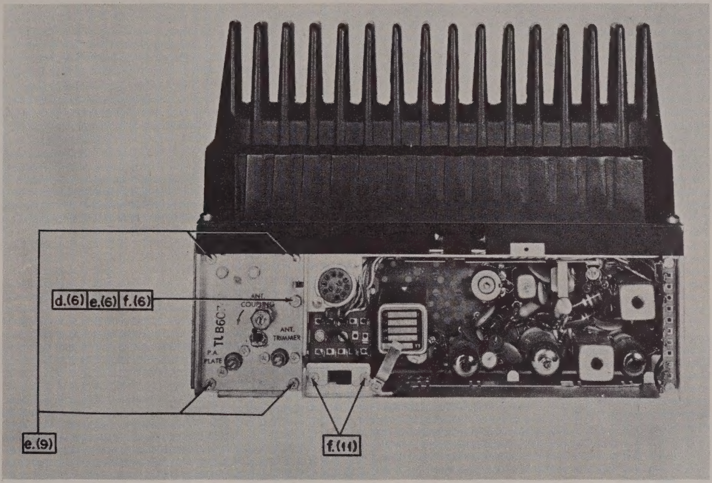


Figure 12.

e. Removal of Power Amplifier Deck (Figures 11 & 12)

(1) Loosen three screws and slide exciter bottom cover out in direction of power supply.

(2) Remove antenna output lead from harmonic filter.

(3) Remove two screws in power amplifier cover near power supply.

(4) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

(5) Remove lead to output coupling coil from filter.

(6) Remove mounting screw from opposite side and drop out filter.

(7) Unsolder center lead of shielded wire.

(8) Remove screw and lead to plate connector on power amplifier tube.

(9) Remove four mounting screws and lift out deck.

(3) Remove two screws in power amplifier cover near power supply.

(4) Loosen two screws near rear heat sink and slide cover out in direction of power supply.

(5) Remove lead to output coupling coil from filter.

(6) Remove mounting screw from opposite side and drop out filter.

(7) Unsolder red-wht and red-yel leads.

(8) Unsolder red-wht lead.

(9) Unsolder orange lead.

(10) Unsolder red-blu lead.

(11) Remove two mounting screws (Hi-Lo switch) and remove resistor board and switch.

4. TONE OSCILLATOR DISASSEMBLY (Dual Squelch Models)

STEP A. - Loosen two screws until tone oscillator can be lifted from its mounting location (Figure 13).

STEP B. - Lift out tone oscillator and fold back (Figure 14).

STEP C. - Remove printed circuit board mounting screw and fold board away from chassis (Figures 14 & 15).

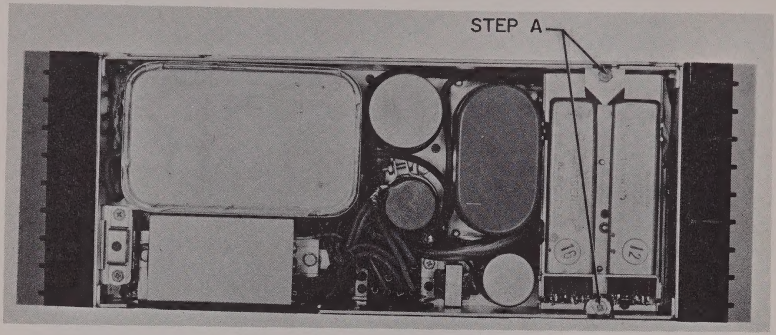

STEP A
AEPD-6393-A (MC6761)

Figure 13.

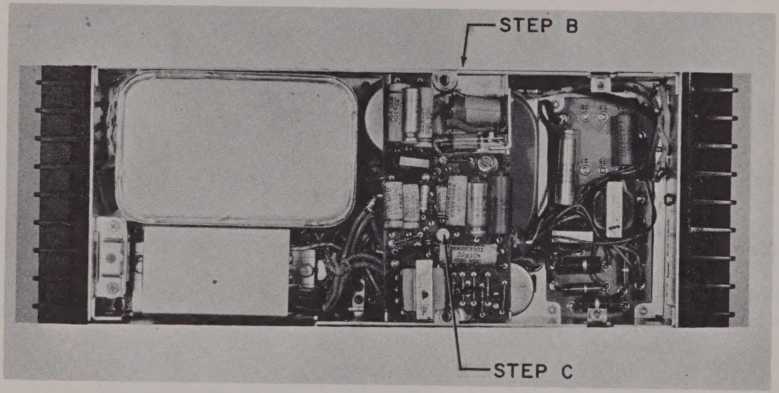

STEP B
STEP C
AEPD-6394-O (MC6762)

Figure 14.

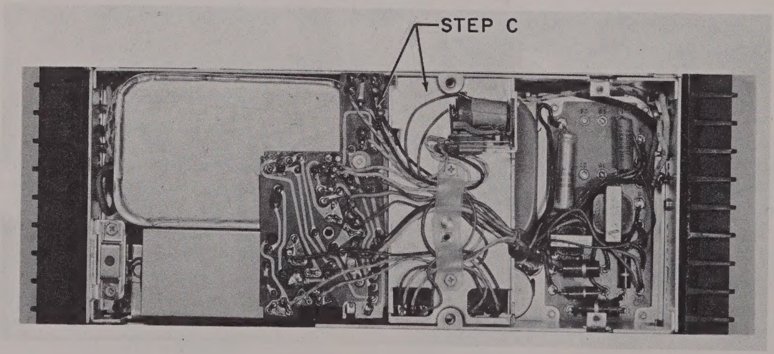

STEP C
AEPD-6395-O (MC6763)

Figure 15.

5. DUAL SQUELCH "PRIVATE-LINE" MAINTENANCE

a. Operation

(1) "Vibrasender" Resonant Reed

The "Vibrasender" resonant reed is the frequency-determining element of the tone oscillator for the transmitter. It maintains the oscillator frequency accurate within ±0.15% of the required frequency. The oscillator generates the "Private-Line" tone which is connected to the transmitter modulator through an isolation resistor. The output level of the oscillator is stable and fixed to hold the tone deviation of the transmitted carrier between 1/2 and 1 kc through normal variations of input voltage, temperature, transistor characteristics, component values and modulator sensitivity.

The reed is a precision built device. It consists of a tuned cantilever reed of special steel mounted on a rugged base with a coil and two permanent magnets. The entire assembly is spring-mounted and hermetically sealed in a metal housing to insure long life at peak performance under all types of conditions.

The tone oscillator is designed for continuous operation. No adjustments are required. The design of the "Vibrasender" resonant reed eliminates the need for servicing throughout its useful life.

(2) "Vibrasponder" Resonant Reed

The "Vibrasponder" resonant reed serves as the frequency sensitive switching device in the receiver "Private-Line" squelch circuit.

The tone-actuated squelch circuit begins with a low-pass audio amplifier which receives its input directly from the discriminator. The output of the amplifier is coupled to a driver stage and then to the coil of the resonant reed. When the detected tone signal applied to the reed is the same as its resonant frequency, the reed vibrates and its contacts close the bias circuit to the audio squelch amplifier.

The circuit closure is actually intermittent since the contacts are closed only when the vibrating reed is at the extreme ends of its travel. However, a capacitor in the bias circuit maintains its charge during the open interval. This makes the circuit effectively complete throughout the vibration period of the reed.

The circuit supplies cut-off bias to the audio squelch amplifier. When the squelch amplifier is cut off, the audio amplifier operates to convey audio information to the speaker. In the absence of the proper tone signal, the squelch amplifier operates to cut off the audio amplifier and open the audio path to the speaker.

The basic design and construction of the "Vibrasponder" resonant reed is similar to that previously described for the "Vibrasender" resonant reed. A set of contacts provides the circuit closure required for squelch operation. The sensitivity of the resonant reed is factory adjusted to give optimum performance for several years of continuous duty in the average system. The design of the "Vibrasponder" resonant reed eliminates the need for servicing throughout its useful life.

b. Servicing

There are no special adjustments involved. Servicing is a matter of detecting and replacing defective components.

It is recommended that the serviceman keep a record of the test performed, voltage readings and other pertinent servicing data, each time the equipment is serviced. This will serve as a guide to normal operating conditions of individual units.

(1) Recommended Test Equipment

(a) Motorola Model S1051B, S1051BR, S1053A or S1053AR Transistorized AC Voltmeter

(b) Motorola Model S1052B or S1063A DC Multimeter

(c) Motorola Model T1014A Precision Wide Band Oscilloscope or Motorola Model T1015A General Purpose Oscilloscope

(2) Transmitter Tone Oscillator Voltage Measurement

Locate and check the A+ and A- voltages for the tone oscillator circuit by referring to the appropriate schematic diagram. Adverse effects on oscillator performance can occur if the measured voltage is not up to the level indicated on the diagram.

(3) "Vibrasponder" Resonant Reed Drive Voltage

Measure the driving voltage on the coil of the "Vibrasponder" resonant reed by connecting the a-c voltmeter across terminals A-A at the reed base. Make the measurement under the following conditions.

(a) Received carrier is modulated with correct "Private-Line" tone.

(b) Absence of voice modulation.

(c) Receiver A+ and A- voltages at proper level.

Under the previous conditions the driving voltage should be above 2.5 v a-c. This reading will vary if the receiver voltages (A+ & A-) are above or below normal.

If the receiver voltages are correct and the driving voltage is below 2.5 v a-c, check voltages and resistances in the tone oscillator circuit to locate the defective component. If no defective components are located, replace the "Vibrasponder" resonant reed.

NOTE

Transistors are highly dependable components and do not normally require replacement.

(4) Transmitter Tone Deviation

The IDC ("Instantaneous Deviation Control") Adjustment Procedure included in this manual may be used to determine proper operation of the tone oscillator in the transmitter. Refer to this procedure for detailed information concerning measurement of "Private-Line" tone deviation. If this procedure indicates insufficient (or lack of) tone deviation and the transmitter modulates normally with an audio input, check the tone oscillator circuit for incorrect voltages or resistances to locate the defective component.

NOTE

Transistors are highly dependable components and do not normally require replacement.

If all voltage and resistance readings are correct, replace the "Vibrasponder" resonant reed.

(5) Symptoms, Causes and Remedies

(a) Symptom: Mobile receiver audio signal spasmodic or intermittent.
Cause: Defective tone contacts on squelch tail eliminator relay in transmitting station.
Remedy: (1) Replace defective relay.
(2) Check transmitting station tone deviation.

CAUTION

Cleaning or adjustment of relay contacts is not recommended. This should only be attempted as an emergency procedure.

(b) Symptom: One mobile radio set (normal r-f power output) has difficulty contacting a station while others do not.
Cause: Insufficient (or lack of) tone deviation in mobile transmitter.
Remedy: Check transmitter tone deviation as previously described and replace defective component.

(c) Symptom: All units in network have difficulty contacting a particular unit.
Cause: Defective receiver in particular unit.
Remedy: Check tone amplifier and "Vibrasponder" resonant reed in defective receiver as previously described.

(d) Symptom: Units hear squelch tail noises from particular unit but not from all units.
Cause: Defective squelch tail eliminator relay in particular unit.
Remedy: Replace defective relay. SEE PREVIOUS CAUTION.

6. ACCESSORY CONVERSION INSTRUCTIONS

a. General

The following instructions are for converting ±6 volt "Motrac" radio set accessories for ±12 volt operation.

The conversion requires modifying the ±6 volt control head to operate from a ±12 volt electrical system. On trunk mount radio sets, the cable kit must also be modified. These modifications enable the accessory items to be transferred from a vehicle with a ±6 volt electrical system to a vehicle with a ±12 volt electrical system. However, be sure the polarity reversing plug and voltage plug on the radio sets are in the proper positions.

b. Conversion Instructions

The following tables list the various control heads and cable kits that can be converted. The modifications required to convert a control head or cable kit are indicated by numbers in the MODIFICATION PROCEDURE NO. column of each chart. These numbers pertain to the procedures that follow these charts.

DASH MOUNT CONTROL HEADS

CONTROL HEAD MODEL NO.	VOLTAGE CONVERSION		RADIO SET APPLICATION		MODIFICATION PROCEDURE NO.
	From	To	FREQ.	SQUELCH OPERATION	
TCN6027AE	6	12	1	Carrier	1,2,3,4,5
TCN6027AF	6	12	2	Carrier	
TCN6027AG	6	12	1	Dual	
TCN6027AH	6	12	2	Dual	
TCN6027AE-1	6	12	1	Carrier	1,3,4,5,6
TCN6027AF-1	6	12	2	Carrier	
TCN6027AG-1	6	12	1	Dual	
TCN6027AH-1	6	12	2	Dual	
*TCN6047AE	6	12	1	Carrier	1,4,5,6,8,12
*TCN6047AF	6	12	2	Carrier	
*TCN6047AG	6	12	1	Dual	
*TCN6047AH	6	12	2	Dual	

*"Extender" control heads

TRUNK MOUNT CONTROL HEADS

CONTROL HEAD MODEL NO.	VOLTAGE CONVERSION		RADIO SET APPLICATION		MODIFICATION PROCEDURE NO.
	From	To	FREQ.	SQUELCH OPERATION	
TCN6030AE	6	12	1	Carrier	2,7
TCN6030AF	6	12	2	Carrier	
TCN6030AG	6	12	1	Dual	
TCN6030AH	6	12	2	Dual	
TCN6030AE-1	6	12	1	Carrier	7
TCN6030AF-1	6	12	2	Carrier	
TCN6030AG-1	6	12	1	Dual	
TCN6030AH-1	6	12	2	Dual	
*TCN6045AE	6	12	1	Carrier	7,13
*TCN6045AF	6	12	2	Carrier	
*TCN6045AG	6	12	1	Dual	
*TCN6045AH	6	12	2	Dual	
*TCN6045AE-1	6	12	1	Carrier	1,13
*TCN6045AF-1	6	12	2	Carrier	
*TCN6045AG-1	6	12	1	Dual	
*TCN6045AH-1	6	12	2	Dual	

*"Extender" control heads

TRUNK INSTALLATION CABLE KITS

CABLE KIT MODEL NO.	VOLTAGE CONVERSION		RADIO SET APPLICATION		MODIFICATION PROCEDURE NO.
	From	To	FREQ.	SQUELCH OPERATION	
TKN6057A	6	12	1	Dual or Carrier	8,9,10
TKN6057A-1	6	12	1	Dual or Carrier	6,8,9,10,11
TKN6058A	6	12	2	Dual or Carrier	8,9,10
TKN6058A-1	6	12	2	Dual or Carrier	6,8,9,10,11
*TKN6096A	6	12	1	Dual or Carrier	6,8,9,10,11,14
*TKN6097A	6	12	2	Dual or Carrier	6,8,9,10,11,14

*"Extender" cable kits

c. Modification Procedures

(Refer to the radio set schematic diagram)

(1) Replace the two 6 volt indicator lamps with 12 volt lamps (Motorola Part No. 65R4151).

(2) Remove diode CR501 and make a straight through circuit connection.

(3) Move the lead from pin 18 of receptacle J502 to pin 4 of this receptacle.

(4) Replace fuse F501 with a 5 amp non slow-blow fuse (Motorola Part No. 65R52293).

(5) Replace fuse F502 with a 15 amp non slow-blow fuse (Motorola Part No. 65R4165 fuse and 43A831204 fuse holder adapter).

(6) Move the ORG control head cable attached to the exterior fuse block, to the accessory or "on" position of the ignition switch. Leave the TRANS-FILAMENT switch in the ON position after conversion, since the transmitter filaments will be controlled by the ignition switch.

(7) Remove the BLK jumper connected across resistors R501 and R502.

(8) Transpose the leads connected to pins 4 and 18 of receptacle J502.

(9) Replace fuse F403 with a 5 amp non slow-blow fuse (Motorola Part No. 65R52293).

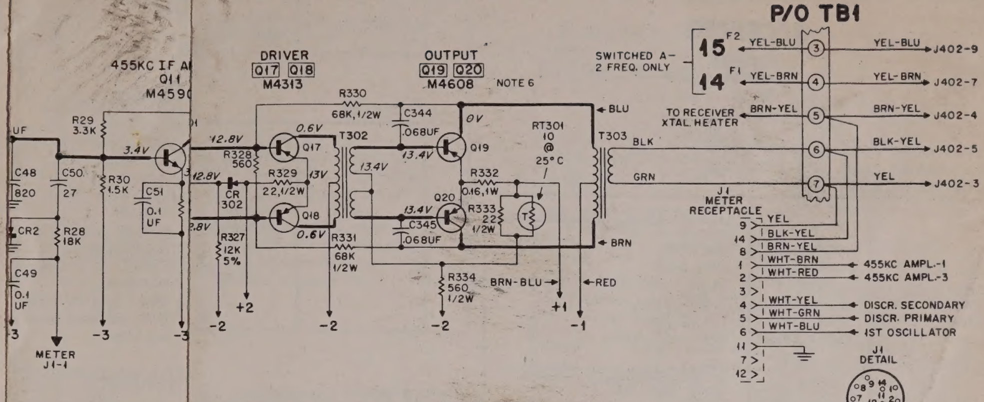
(10) Replace fuse F401 with a 15 amp non slow-blow fuse (Motorola Part No. 65R4165 fuse and 43A831204 fuse holder adapter).

(11) Replace fuse F402 with a 6-1/4 amp non slow-blow fuse (Motorola Part No. 65B475247).

(12) Remove plug P502 from the RED external control head lead. Connect this lead internally to pin 4 (for negative ground installations), or pin 17 (for positive ground installations) of receptacle J502.

(13) Move lead from pin 32 of terminal board TB501 to pin 4 (for negative ground installations), or pin 17 (for positive ground installations) on terminal board TB501.

(14) Remove external control head lead W408.


P/O TB1
SWITCHED A-
2 FREQ. ONLY
15 F2
14 F1
YEL-BLU
YEL-BRN
BRN-YEL
BLK-YEL
YEL
J402-9
J402-7
J402-4
J402-5
J402-3
TO RECEIVER
XTAL HEATER
455KC IF A
Q11
M459
DRIVER
Q17 Q18
M4313
OUTPUT
Q19 Q20
M4608
NOTE 6
R330
68K, 1/2W
C344
.068UF
0V
RT301
10
@
25° C
T302
T303
BLK
GRN
BLU
BRN
R29
3.3K
R30
1.5K
C48
820
C50
27
C51
0.1
UF
CR2
R28
18K
C49
0.1
UF
3.4V
12.8V
0.6V
13.4V
13V
R328
560
R329
22,1/2W
CR
302
R327
12K
5%
R331
68K
1/2W
R332
0.16,1W
R333
22
1/2W
C345
.068UF
R334
560
1/2W
BRN-BLU
RED
METER
J1-1
-3
+2
-2
+1
-1
J1
METER
RECEPTACLE
BLK-YEL
BRN-YEL
WHT-BRN
WHT-RED
WHT-YEL
WHT-GRN
WHT-BLU
455KC AMPL.-1
455KC AMPL.-3
DISCR. SECONDARY
DISCR. PRIMARY
1ST OSCILLATOR
J1
DETAIL

MODEL TABLE

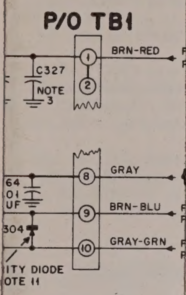
RECEIVERS					
S	MODEL NUMBER	SUFFIX	NO. OF FREQ.	CHANNEL SPACING	FREQ. RANGE
OAA	TRD1321AA		1	60KC	136-150.8MC
	TRD1322AA				150.8-162MC
	TRD1323AA				162-174 MC
OAB	TRD1321AB		1	30KC	136-150.8MC
	TRD1322AB				150.8-162MC
	TRD1323AB				162-174 MC
OAC	TRD1321AC		2	60KC	136-150.8MC
	TRD1322AC				150.8-162MC
	TRD1323AC				162-174MC
OAD	TRD1321AD		2	30KC	136-150.8MC
	TRD1322AD				150.8-162MC
	TRD1323AD				162-174MC

TRANSMITTERS				
SERIES	MODEL NUMBER	SUFFIX	NO. OF FREQ.	FREQ. RANGE
TTD1250AA	TTD1251AA	2	1	136 - 140MC
	TTD1252AA	2		140-150.8MC
	TTD1253AA	2		150.8-162MC
	TTD1250AB	2	2	150.8-174 MC

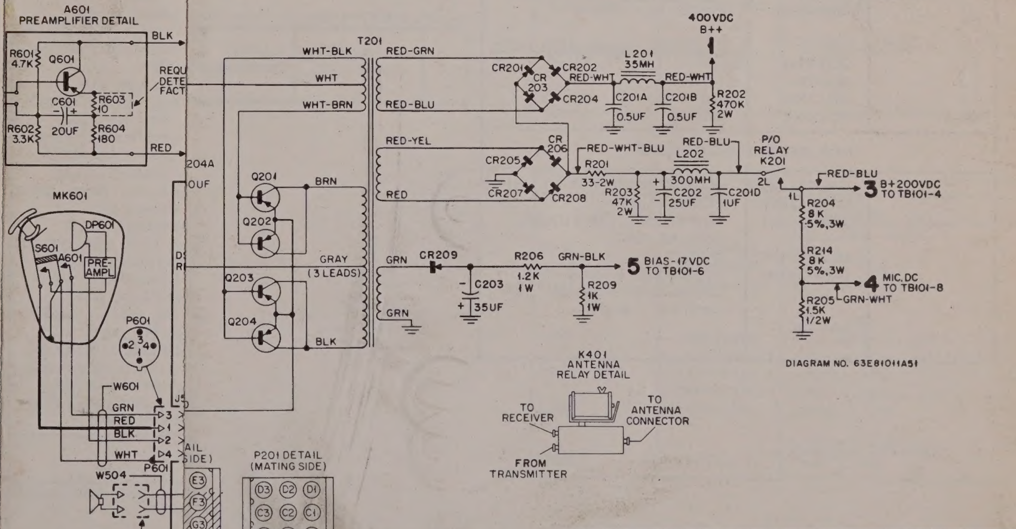
POWER SUPPLY		
L ER	SUFFIX	POWER OUTPUT
OAA	4	25W

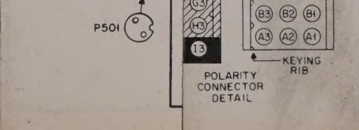
CABLE KIT		
MODEL NUMBER	SUFFIX	NO. OF FREQ.
TKN6055A		1
TKN6056A		2

CONTROL HEAD			
MODEL NUMBER	SUFFIX	NO. OF FREQ.	TYPE OF INSTALLATION
TCN6025AE		1	DASH-MOUNT
TCN6025AF		2	DASH-MOUNT
TCN6026AE		1	TRUNK MOUNT
TCN6026AF		2	TRUNK MOUNT


P/O TB1
BRN-RED
C327
NOTE 3
GRAY
BRN-BLU
GRAY-GRN
64
01
UF
304
ITY DIODE
OTE 11

DASH-M ER SUPPLY


A601
PREAMPLIFIER DETAIL
R601 4.7K
Q601
C601 20UF
R603 10
R602 3.3K
R604 180
BLK
RED
REQU
DETE
FACT
MK601
DP601
S601
A601
PRE-AMPL
P601
W601
GRN
RED
BLK
WHT
T201
WHT-BLK
WHT
WHT-BRN
RED-GRN
RED-BLU
RED-YEL
RED
Q201
Q202
Q203
Q204
BRN
GRAY
(3 LEADS)
BLK
204A
OUF
400VDC
B++
1
CR201
CR202
CR 203
CR204
L201
35MH
RED-WHT
C201A 0.5UF
C201B 0.5UF
R202 470K 2W
CR 206
CR205
CR207
CR208
RED-WHT-BLU
RED-BLU
L202
300MH
R201 33-2W
R203 47K 2W
C202 25UF
C201D 1UF
P/O RELAY K201
2L
1L
RED-BLU
3 B+200VDC TO TB101-4
R204 8K 5%,3W
R214 8K 5%,3W
4 MIC. DC TO TB101-8
R205 1.5K 1/2W
GRN-WHT
GRN
CR209
R206 1.2K 1W
GRN-BLK
5 BIAS-17 VDC TO TB101-6
C203 35UF
R209 1K 1W
GRN
DIAGRAM NO. 63E81011A51
K401
ANTENNA
RELAY DETAIL
TO RECEIVER
TO ANTENNA CONNECTOR
FROM TRANSMITTER


P601
W504
P501
AIL
SIDE)
E3
F3
G3
H3
13
P201 DETAIL
(MATING SIDE)
D3 D2 D1
C3 C2 C1
B3 B2 B1
A3 A2 A1
KEYING RIB
POLARITY
CONNECTOR
DETAIL

136-174 MC, 25 W, ±12 V Carrier Squelch
"Motrac" Radio Set
Schematic & Intercabling Diagram
Motorola No. 63E81011A51-O

TRUNK INSTALLATION CABLE KITS

CABLE KIT MODEL NO.	VOLTAGE CONVERSION		RADIO SET APPLICATION		MODIFICATION PROCEDURE NO.
	From	To	FREQ.	SQUELCH OPERATION	
TKN6057A	6	12	1	Dual or Carrier	8,9,10
TKN6057A-1	6	12	1	Dual or Carrier	6,8,9,10,11
TKN6058A	6	12	2	Dual or Carrier	8,9,10
TKN6058A-1	6	12	2	Dual or Carrier	6,8,9,10,11
*TKN6096A	6	12	1	Dual or Carrier	6,8,9,10,11,14
*TKN6097A	6	12	2	Dual or Carrier	6,8,9,10,11,14

*"Extender" cable kits

c. Modification Procedures

(Refer to the radio set schematic diagram)

(1) Replace the two 6 volt indicator lamps with 12 volt lamps (Motorola Part No. 65R4151).

(2) Remove diode CR501 and make a straight through circuit connection.

(3) Move the lead from pin 18 of receptacle J502 to pin 4 of this receptacle.

(4) Replace fuse F501 with a 5 amp non slow-blow fuse (Motorola Part No. 65R52293).

(5) Replace fuse F502 with a 15 amp non slow-blow fuse (Motorola Part No. 65R4165 fuse and 43A831204 fuse holder adapter).

(6) Move the ORG control head cable attached to the exterior fuse block, to the accessory or "on" position of the ignition switch. Leave the TRANS-FILAMENT switch in the ON position after conversion, since the transmitter filaments will be controlled by the ignition switch.

(7) Remove the BLK jumper connected across resistors R501 and R502.

(8) Transpose the leads connected to pins 4 and 18 of receptacle J502.

(9) Replace fuse F403 with a 5 amp non slow-blow fuse (Motorola Part No. 65R52293).

(10) Replace fuse F401 with a 15 amp non slow-blow fuse (Motorola Part No. 65R4165 fuse and 43A831204 fuse holder adapter).

(11) Replace fuse F402 with a 6-1/4 amp non slow-blow fuse (Motorola Part No. 65B475247).

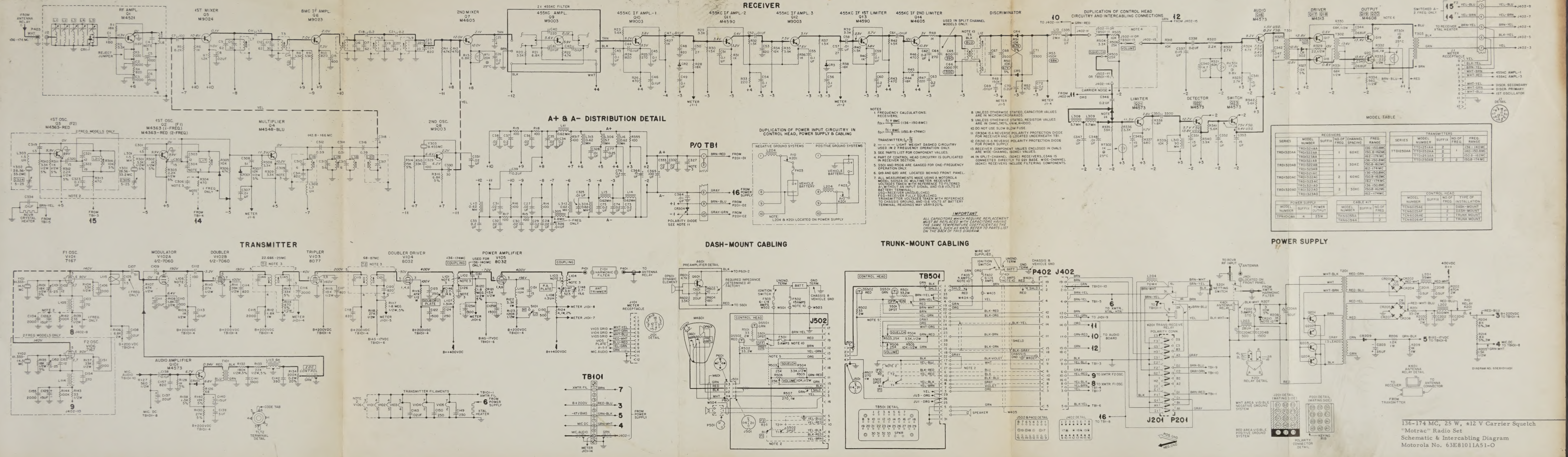
(12) Remove plug P502 from the RED external control head lead. Connect this lead internally to pin 4 (for negative ground installations), or pin 17 (for positive ground installations) of receptacle J502.

(13) Move lead from pin 32 of terminal board TB501 to pin 4 (for negative ground installations), or pin 17 (for positive ground installations) on terminal board TB501.

(14) Remove external control head lead W408.

IMPORTANT

+1, +2, -1, -2 etc. ARE CIRCUIT TIE POINT INDENTIFICATION NUMBERS AND DO NOT CORRESPOND TO VOLTAGE READINGS AT THESE POINTS.


RECEIVER
RF AMPL. Q1 M4521
1ST MIXER Q5 M9024
8MC IF AMPL. Q6 M9023
2ND MIXER Q7 M4605
455KC AMPL. Q9 M9003
455KC IF AMPL.-1 Q10 M9003
455KC IF AMPL.-2 Q11 M4590
455KC IF AMPL.-3 Q12 M9003
455KC IF 1ST LIMITER Q13 M4590
455KC IF 2ND LIMITER Q14 M4605
DISCRIMINATOR
DUPLICATION OF CONTROL HEAD CIRCUITRY AND INTERCABLING CONNECTIONS
AUDIO Q16 M4573
DRIVER Q17 Q18 M4313
OUTPUT Q19 Q20 M4608
P/O TB1
1ST OSC. Q3 M4363-RED
1ST OSC. Q2 M4363-(1-FREQ.) M4363-RED (2-FREQ.)
MULTIPLIER Q4 M4548-BLU
2ND OSC. Q8 M9003
A+ & A- DISTRIBUTION DETAIL
LIMITER Q21 M4573
DETECTOR Q22 M4573
SWITCH Q23 M4573
MODEL TABLE
TRANSMITTER
F1 OSC. V101 7167
MODULATOR V102A 1/2-7060
DOUBLER V102B 1/2-7060
TRIPLER V103 8077
DOUBLER DRIVER V104 8032
POWER AMPLIFIER V105 8032
AUDIO AMPLIFIER Q101 M4573
F2 OSC. V106 7167
TRANSMITTER FILAMENTS
TB101
DASH-MOUNT CABLING
J502
TRUNK-MOUNT CABLING
TB501
P402 J402
J201 P201
POWER SUPPLY

NOTES

1. FREQUENCY CALCULATIONS: RECEIVERS;

$$f_{01}=\frac{fc+8MC}{5}\ (136-150.8MC)$$

$$f_{01}=\frac{fc-8MC}{5}\ (150.8-174MC)$$

TRANSMITTER; $f_0=\frac{fc}{12}$

2. — — — — LIGHT WEIGHT DASHED CIRCUITRY USED IN 2 FREQUENCY OPERATION ONLY.
3. SEE PARTS LIST FOR COMPONENT VALUES.
4. PART OF CONTROL HEAD CIRCUITRY IS DUPLICATED IN RECEIVER SECTION.
5. S501 AND R506 ARE GANGED FOR ONE-FREQUENCY OPERATION ONLY.
6. Q19 AND Q20 ARE LOCATED BEHIND FRONT PANEL.
7. ALL MEASUREMENTS MADE USING A MOTOROLA MODEL S1052A DC MULTIMETER. RECEIVER VOLTAGES TAKEN WITH REFERENCE TO FILTERED A-, WITHOUT AN INPUT SIGNAL AND 13.8 VOLTS AT BATTERY TERMINAL.
USQ = RECEIVER UNSQUELCHED.
FSQ = RECEIVER FULLY SQUELCHED.
TRANSMITTER VOLTAGES TAKEN WITH REFERENCE TO CHASSIS GROUND, AND 13.6 VOLTS AT BATTERY TERMINAL. READINGS MAY VARY ±20%.
8. UNLESS OTHERWISE STATED, CAPACITOR VALUES ARE IN MICROMICROFARADS.
9. UNLESS OTHERWISE STATED, RESISTOR VALUES ARE IN OHMS, ±10%, 1/4 W, K=1000.
10. DO NOT USE SLOW BLOW FUSE.
11. CR304 IS A REVERSE POLARITY PROTECTION DIODE FOR RECEIVER AND IS LOCATED UNDERNEATH TB1.
12. CR210 IS A REVERSE POLARITY PROTECTION DIODE FOR POWER SUPPLY.
13. RECEIVER COMPONENT VALUES ENCLOSED IN OVALS ARE WIDE-CHANNEL (60KC) VALUES.
14. IN SPLIT-CHANNEL (30KC) RECEIVERS, C346 IS CONNECTED DIRECTLY TO Q21 BASE. WIDE-CHANNEL (60KC) RECEIVERS INCLUDE FILTERING COMPONENTS.

IMPORTANT

ALL CAPACITORS WHICH REQUIRE REPLACEMENT MUST BE REPLACED WITH CAPACITORS HAVING THE SAME TEMPERATURE COEFFICIENT AS THE ORIGINALS, SUCH AS N470. REFER TO PARTS LIST ON THE BACK OF THIS DIAGRAM.

MODEL TABLE

RECEIVERS

SERIES	MODEL NUMBER	SUFFIX	NO. OF FREQ.	CHANNEL SPACING	FREQ. RANGE
TRD1320AA	TRD1321AA		1	60KC	136-150.8MC
	TRD1322AA				150.8-162MC
	TRD1323AA				162-174 MC
TRD1320AB	TRD1321AB		1	30KC	136-150.8MC
	TRD1322AB				150.8-162MC
	TRD1323AB				162-174 MC
TRD1320AC	TRD1321AC		2	60KC	136-150.8MC
	TRD1322AC				150.8-162MC
	TRD1323AC				162-174 MC
TRD1320AD	TRD1321AD		2	30KC	136-150.8MC
	TRD1322AD				150.8-162MC
	TRD1323AD				162-174 MC

TRANSMITTERS

SERIES	MODEL NUMBER	SUFFIX	NO. OF FREQ.	FREQ. RANGE
TTD1250AA	TTD1251AA	2	1	136-140MC
	TTD1252AA	2		140-150.8MC
	TTD1253AA	2		150.8-162MC
	TTD1250AB	2	2	150.8-174 MC

POWER SUPPLY

MODEL NUMBER	SUFFIX	POWER OUTPUT
TPN1010AA	4	25W

CABLE KIT

MODEL NUMBER	SUFFIX	NO. OF FREQ.
TKN6055A		1
TKN6056A		2

CONTROL HEAD

MODEL NUMBER	SUFFIX	NO. OF FREQ.	TYPE OF INSTALLATION
TCN6025AE		1	DASH-MOUNT
TCN6025AF		2	DASH-MOUNT
TCN6026AE		1	TRUNK MOUNT
TCN6026AF		2	TRUNK MOUNT

136-174 MC, 25 W, ±12 V Carrier Squelch
"Motrac" Radio Set
Schematic & Intercabling Diagram
Motorola No. 63E81011A51-O

MICROPHONE

TMN6000A Dynamic Microphone EPD-7864-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		AMPLIFIER, AF
A601	1V861317	mic pre-amp; assy incl 1V859594 BOARD, circuit; ref parts C601, Q601, R601, 602, 603, 604
		CAPACITOR, fixed:
C601	23C844927 or23C82601A03	20 uf +100-10%; 25 v
		CARTRIDGE, microphone:
DP601	59C852603	dyn type; 175 imp at 1 kc
		CONNECTOR, plug:
P601	28A16370	male; 4 cont incl 41K838823 SPRING
		TRANSISTOR, (SEE NOTE)
Q601	48A124317	P-N-P; does not incl 14A861196 INSULATOR, transistor
		RESISTOR, fixed: ±10%; 1/2 w unl stated
R601	6R6080	4.7K
R602	6R5581	3.3K
R603	6R5621	10
R604	6R5660	180
		SWITCH,
S601	40C82202B01	push: dpst; does not incl 38A852699 BUTTON, push
		CORD, microphone:
W601	1V80707A58	incl 30K852742 CORE, coiled: tinsel; 4 cond; 41A852707 SPRING; 29A847033 LUG, term.; 4 req'd; 29A847034 LUG, term.; 4 req'd; ref part P601
NON-REFERENCED ITEMS		
	1V864588	BACKHOUSING AND HANG-UP STUD ASSY
	42A852710	STRAP, strain relief
	15K858486	HOUSING, front
	13K858488	GRILLE
	35A852701	CLOTH, grille
	32A852702	GASKET
	14A857138	INSULATOR
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	4K861625	WASHER
	1V865398	MOUNTING KIT, microphone: incl 64A85596 BRACKET

NOTES:

Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

PARTS LISTS FOR PRINTED CIRCUIT ASSEMBLIES ARE ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT DIAGRAM.

MOTOROLA INC. COMMUNICATIONS DIVISION

SERVICE DIAGRAMS

MOTRAC®

MOBILE FM TWO-WAY RADIO

136-174 MC 25 W RF POWER

±12 VOLT SYSTEMS

CARRIER SQUELCH MODELS

U43HHT-1000D
U43HHT-1010D
U43HHT-1030D
U43HHT-1100D
U43HHT-1110D
U43HHT-1130D

PRINTED IN U. S. A.
® Reg. U.S. Pat. Off.

68P81011A50

PARTS LIST for Schematic Diagram 63E81011A51-O

RECEIVER

LEGEND
L = 136-150.8 mc
M = 150.8-162 mc
H = 162-174 mc

TLD6261A RF Ampl. (136-150.8 mc)
TLD6262A RF Ampl. (150.8-162 mc)
TLD6263A RF Ampl. (162-174 mc) EPD-7821-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf; 500 v; unl stated
C1	21K840046	100 ±10%
C2, 3, 5	21B861219	1000 GMV
C4L	21R410063	10 ±0.5 uuf; NP0
C4M	21D82610C23	6.8 ±0.5 uuf; NP0
C4H	21K857337	7.5 ±0.5 uuf; NP0
C6	21C82187B11	1500 ±10%; 100 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR1	48C82617C01 or48C82617C03	silicon
		CONNECTOR, recep:
J2	9C87120	female; single cont
		COIL, RF
L1L	24B82890D02	coded CB4
L1M	24B82890D04	coded CB6
L1H	24B82890D06	coded CB8
L2L, 3L, 4L	24B82890D01	coded CB3
L2M, 3M, 4M	24B82890D03	coded CB5
L2H, 3H, 4H	24B82890D05	coded CB7
L5L	24B82890D07	coded CB9; incl ref part CR1
L5M	24B82890D08	coded CC1; incl ref part CR1
L5H	24B82890D09	coded CC2; incl ref part CR1
L6L	24V80901A66	coded CB1; incl ref parts C4L, C6 and 76B82451B03 CORE, tuning
L6M	24V80901A67	coded CB2; incl ref parts C4M, C6 and 76B82451B03 CORE, tuning
L6H	24V80901A73	coded CC3; incl ref parts C4H, C6 and 76B82451B03 CORE, tuning
		TRANSISTOR, (SEE NOTE)
Q1	48R134521	P-N-P; type M4521
		RESISTOR, fixed; ±10%; 1/4 w
R1	6K128904	18K
R2	6K129231	3.3K
R3	6B127800	220
R4	6K129432	820
NON-REFERENCED ITEMS		
	1V80721A80	HOUSING ASSY: incl ref part J2
	64B82634D01	COVER, housing
	1V80721A84	TOP PLATE AND TUNING COLLAR ASSY.
	26A82904D01	SHIELD
	1V80721A82	AMPLIFIER PLATE AND CAPACITOR ASSY. incl ref parts C2, 3 and 5

TLN6342A & TLN6343A Metering Socket & Cable Kit EPD-7838-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CONNECTOR, receptacle:
J1	9C857358	female, 12 cont.

IF FILTER EPD-7827-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		FILTER, IF:
Z1	TFN6013AS	bandpass; 30 kc; incl 1V80721A77 455 kc Filter Amplifier Board Assy. (detail EPD-7699)
	orTFN6013AW	bandpass; 60 kc; incl 1V80721A77 455 kc Filter Amplifier Board Assy. (detail EPD-7699)

TLN6349A Chassis Kit EPD-7823-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C365	23K868713	100 uf +100-10%; 25 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR304	48B865848	silicon
		TRANSISTOR, (SEE NOTE)
Q19, 20	48R134608	P-N-P; type M4608
		TRANSFORMER, AF:
T303	25C855092	pri: BLU, BRN; RED tap; res 0.5 sec: GRN, BLK; res 0.2
		BOARD, term:
TB1	1V80704A74	10 solder lugs
		SOCKET, transistor:
XQ19, 20	9B851303	female; 2 cont

TLN6479A Chassis Hdwe Kit EPD-7824-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C364	21D82428B06	.01 uf +70-30%; 100 v

TRANSMITTER

TLN6236A Xmtr. Chassis Kit (150.8-174 MC)
TLN6315A Xmtr. Chassis Kit (136-140 MC)
TLN6322A Xmtr. Chassis Kit (140-150.8 MC) EPD-7839-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf; ±10%; 500 v; unl. stated
C122	21B800801	1500 GMV +100% max
C123, 149, 150	21K863801	250
C124	1V864703	assy.; incl. 21A112247 CAPACITOR, fixed: 250 uuf; ±10%; 850 v & 29R5360 LUG, solder (No. 6)
C125	21K800836	2 sect.; c/o:
C125A		1500
C125B		1500
C126	21R122236	18 ±5%; NP0 (150.8-174 mc)
	or21K840712	36 ±5%; (136-150.8 mc)
C131	21K835358	15
C148	19K800032	var.; 2.7-19.6
C161	21K868935	3 ±.25 uuf; 200 v (136-140 mc only)
		CONNECTOR, receptacle:
J101	9C82201E01	female; 12 cont.
		COIL, RF
L101	24A82112D01	plate coupling (150.8-174 mc)
	or24B82009C01	plate coupling (136-150.8 mc)
L102	24B855170	grid coupling
L107	24K832590	choke; 1.3 uh
L116	24K861264	choke; 1.0 uh
		RESISTOR, fixed: ±10%; 1/2 w; unl. stated
R119	6R6048	47K
R120	6R401017	1.8 meg ±5%
R121	6S6477	15K
R122	6R5718	3.3K; 1 w
R123	6R5631	120K
R124	17K892469	4 ±2%; 1 w
		SWITCH, slider:
S101	40A11589	spdt
		BOARD, terminal:
TB101	1V80704A74	10 solder lug term.
		ELECTRON TUBE:
V104, 105	97T116A02	type 8032
		SOCKET, tube:
XV104, 105	9C890001	8 cont

TLD6080A & TLD6222A PA Deck EPD-7840-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf ±10%; 500 v; unl. stated
C130	21A824948	500
C146	19K800032	var.; 2.7-19.6
C147	19B838179	var.; 4.9-52.5
		COIL, RF:
L103	24B855174	plate coupling: 150.8-174 mc
	or24B82008C01	plate coupling: 136-150.8 mc
L104	24B855175	output coupling: 150.8-174 mc
	or24B82015C01	output coupling: 136-150.8 mc
L108	24K832590	choke; 1.3 uh
		CONNECTOR, plug:
P101	29K5414	male; 1 cont

Harmonic Filter EPD-7861-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
Z101	TLD6090A	Filter Assembly

TLN6093A Chassis Hardware Kit EPD-7862-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
	1V863720	RADIATOR ASSY.: incl. 15B865665 HOUSING, radiator 3A857308 SCREW: 4 req'd

FRONT PANEL

TGN6002A Front Panel Kit EPD-7863-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
NON-REFERENCED ITEMS		
	55B852658	HANDLE
	41A864597	SPRING, 2 req'd
	55A852656	LOCK, incl.; 2-55K893872 KEYS

TKN6108A & TKN6109A Intercabling Kit EPD-7825-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CONNECTOR, recep:
J401	9A867432	female; 1 cont
J402	28C802820	male; 19 cont
		RELAY, armature:
K401	80C82376C04 or80C82762A09	coax; 12 v; 1 form "C"; incl RG-58/U and RG-188/U coax cable
		CONNECTOR, plug:
P401, 403	28A474006	male; 1 cont

TKN6055A & TKN6056A Cable Kit EPD-7828-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		FUSE, cartridge:
F401	65R4165	15 amp; 32 v
F402	65B475247	6-1/4 amp; 32 v
F403	65R52293	5 amp; 250 v
		CONNECTOR, plug:
P402		incl.: 9C801050 CONNECTOR, plug: 19-cont.; female 15D82075D03 HOUSING L.H. 15D82075D01 HOUSING R.H. 3S131758 SCREW, 4-40 x 1-1/8" 2 req'd 2S129924 NUT, hex: 4-40 x 1/4"; 2 req'd; 1V80717A73 SCREW & KNOB ASSY. 4A11722 WASHER, "C" 4A800671 WASHER: .016" thick 4A82113D01 WASHER: .032" thick; 42K867086 CLAMP, cable 3S132127 SCREW, tapping: No. 6 x 3/4" plain hex head
		CABLE ASSY., special purpose:
W401	1V864644	incl: 30K858553 CABLE, power: 1 cond. No. 12 ga; RED; 22-1/2 ft. req'd 29K832116 LUG, for 3/8" stud; ref parts F401 and XF401
W402	1V864643	incl: 30K858552 CABLE, power: 1 cond; No. 12 ga.; BLK; 5-1/2 ft. req'd 29K832116 LUG, for 3/8" stud
W403	1V80705A19	incl: 29K824456 LUG, for No. 10 stud 37B82603D20 SLEEVE, coded No. 20 29A82602D01 CONNECTOR, plug: 1 cont; ref part XF402
W404	1V80705A18	incl; 29K865065 LUG, for 3/8" stud 37B82603D19 SLEEVE, coded No. 19 29A82602D01 CONNECTOR, plug: 1 cont; ref part XF403
		CABLE, special purpose:
W405	30C858513	13 cond. 17 ft. req'd. 1-freq.
	or30C864650	17 cond. 17 ft. req'd. 2-freq.
		FUSEHOLDER:
XF401		incl. 14A82882A01 BODY 14A82883A01 CAP; 42A82884A01 CLIP, fuse: 2 req'd.
XF402	1V80705A07	incl: 14A82882A01 BODY 14A82883A01 CAP 41A82885A01 SPRING 1V80705A08 FUSE CLIP AND LEAD ASSY.: incl: 42A82884A01 CLIP, fuse 10M343 LEAD, elect: 1 cond. No. 18 ga.; ORG; 57" req'd 1V80705A09 FUSE CLIP AND LEAD ASSY.: incl: 42A82884A01 CLIP, fuse 10M343 LEAD, elect.: 1 cond. No. 18 ga.; ORG; 9" req'd ref part F402
XF403	1V80705A10	incl.: 14A82882A01 BODY 14A82883A01 CAP 41A82885A01 SPRING 1V80705A11 FUSE CLIP AND LEAD ASSY.: incl: 42A82884A01 CLIP, fuse 10M345 LEAD, elect; 1 cond; No. 18 ga.; GRN; 97" req'd 1V80705A12 FUSE CLIP AND LEAD ASSY.: incl: 42A82884A01 CLIP, fuse 10M345 LEAD, elect.; 1 cond; No. 18 ga.; GRN; 9" req'd ref part F403
NON-REFERENCED ITEMS		
	29A82602D01	CONNECTOR, plug: male; single cont.; 19 req'd
		SLEEVE, coded:
	37B82603D01	1
	37B82603D02	2
	37B82603D03	3
	37B82603D04	4
	37B82603D05	5
	37B82603D06	6
	37B82603D07	7
	37B82603D08	8
	37B82603D09	9
	37B82603D10	10
	37B82603D11	11
	37B82603D12	12
	37B82603D13	13
	37B82603D14	14
	37B82603D15	15
	37B82603D16	16
	37B82603D17	17
	37B82603D18	18
	37B82603D21	21

CONTROL HEADS

TCN6025AE, AF, 26AE, AF Control Heads EPD-7835-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		LAMP, incandescent:
DS501, 502	65R4151	6-8 v; .2 amp; 1 cont; type 51
		FUSE, cartridge: (Dash mount)
F501	65R52293	5 amp; 250 v
F502	65R4165	15 amp; 32 v
F503	65B475247	6-1/4 amp; 32 v
		CONNECTOR, recep:
J501	9K830418	female; 4 cont
J502	9C801050	female; 19 cont (Dash mount)
		CONNECTOR, plug: (Dash mount)
P501	9B855112	female; 2 cont; does not incl 15B855111 COVER
		RESISTOR, fixed: unl stated
R501, 502	17C82350A04	33 ±10%; 2 w
R503	18K857840	var; 25K ±30%; .33 w
R504	6R5581	3.3K ±10%; 1/2 w
R505	6R6320	10K ±10%; 1/2 w
R506	18K868896	var; 25K ±30%; .33 w; incl dpst switch; 1-freq
	or18C857698	var; 25K ±30%; .33 w; 2-freq.
R507	6R6336	270 ±10%; 1 w
		SWITCH, toggle:
S501		p/o R506 and 1-freq.
	or40K80247	dpst ("on-off"); 2-freq.
S502	40A80246	dpdt ("F1-F2"); 2-freq.
		BOARD, term: (Trunk mount)
TB501	31C857699	35 female cont term.
		CABLE, power: (Dash mount)
W501	1V80705A13	assy; incl F502, XF502 30K813233 CABLE, pwr; No. 10 ga; RED; 9-1/2 ft. req'd; 29K832116 LUG, for 3/8" stud
		LEAD, elect: (Dash mount)
W502	1V80705A06	assy; incl "in-line" fuseholder with attached conn. leads and ref part XF503; 29K824456 LUG, for No. 10 stud
		CABLE, power: (Dash mount)
W503	30K831572	No. 10 ga; BLK; 10 ft req'd
		WIRE, elect.; (Dash mount)
W504	30A825430	2 cond; No. 18 ga; 36" req'd
		LAMPHOLDER,
XDS501, 502	9B863168	1 cont
		FUSEHOLDER,
XF501	31A824974	clip type
XF502		incl 14A82882A01 BODY, 14A82883A02 CAP, 42A82884A01 CLIP, fuse 2 req'd; 41A82885A01 SPRING
XF503	1V80705A07	assy; incl ref part F503 and 14A82882A01 BODY; 14A82883A01 CAP; 41A82885A01 SPRING; 1V80705A08 FUSE CLIP AND LEAD ASSY: incl 42A82884A01 CLIP, fuse, 10M343 LEAD, elect.: 1 cond; No. 18 ga; ORG; 57" req'd; 1V80705A09 FUSE CLIP AND LEAD ASSY: incl 42A82884A01 CLIP, fuse 10M343 LEAD, elect. No. 18 ga; ORG; 9" req'd
NON-REFERENCED ITEMS		
	61A865158	LENS, RED
	61K865159	LENS, GRN
	3A82670A01	SCREW, control head
	36K858652	KNOB, control: 2 req'd
	2A482070	NUT, ring: knurled

MICROPHONE

TMN6000A Dynamic Microphone EPD-7864-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		AMPLIFIER, AF
A601	1V861317	mic pre-amp; assy incl 1V859594 BOARD, circuit; ref parts C601, Q601, R601, 602, 603, 604
		CAPACITOR, fixed:
C601	23C844927 or23C82601A03	20 uf +100-10%; 25 v
		CARTRIDGE, microphone:
DP601	59C852603	dyn type; 175 imp at 1 kc
		CONNECTOR, plug:
P601	28A16370	male; 4 cont incl 41K838823 SPRING
		TRANSISTOR, (SEE NOTE)
Q601	48A124317	P-N-P; does not incl 14A861196 INSULATOR, transistor
		RESISTOR, fixed: ±10%; 1/2 w unl stated
R601	6R6080	4.7K
R602	6R5581	3.3K
R603	6R5621	10
R604	6R5660	180
		SWITCH,
S601	40C82202B01	push: dpst; does not incl 38A852699 BUTTON, push
		CORD, microphone:
W601	1V80707A58	incl 30K852742 CORE, coiled: tinsel; 4 cond; 41A852707 SPRING; 29A847033 LUG, term.; 4 req'd; 29A847034 LUG, term.; 4 req'd; ref part P601
NON-REFERENCED ITEMS		
	1V864588	BACKHOUSING AND HANG-UP STUD ASSY
	42A852710	STRAP, strain relief
	15K858486	HOUSING, front
	13K858488	GRILLE
	35A852701	CLOTH, grille
	32A852702	GASKET
	14A857138	INSULATOR
	42A852705	CLAMP, cartridge
	14A857137	INSULATOR, cartridge
	4K861625	WASHER
	1V865398	MOUNTING KIT, microphone: incl 64A85596 BRACKET

NOTES:

Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

PARTS LISTS FOR PRINTED CIRCUIT ASSEMBLIES ARE ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT DIAGRAM.

MOTOROLA INC. COMMUNICATIONS DIVISION

SERVICE DIAGRAMS

MOTRAC®

MOBILE FM TWO-WAY RADIO

136-174 MC 25 W RF POWER

±12 VOLT SYSTEMS

CARRIER SQUELCH MODELS

U43HHT-1000D
U43HHT-1010D
U43HHT-1030D
U43HHT-1100D
U43HHT-1110D
U43HHT-1130D

PRINTED IN U. S. A.
® Reg. U.S. Pat. Off.

68P81011A50

CONTENTS

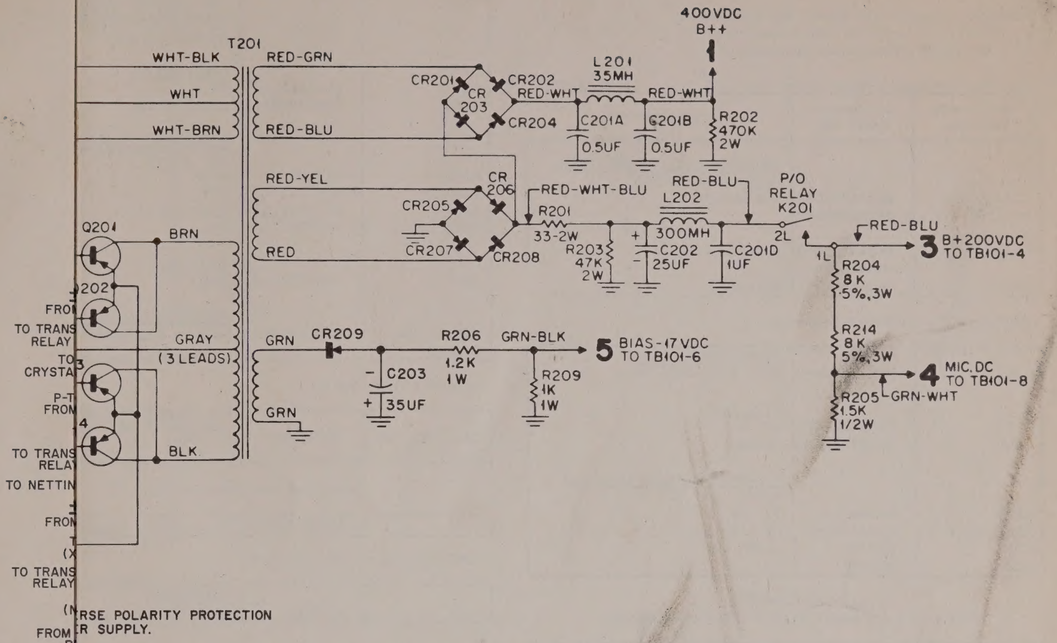
Schematic Diagram and Parts List 63E81011A51
A+ & A- Distribution Detail EEPD-7645
Circuit Board Location Details EPD-7687
1st Oscillator Circuit Board Detail and Parts List EPD-7615
8 MC IF Circuit Board Detail and Parts List EPD-7623
2nd Oscillator Circuit Board Detail and Parts List EPD-7619
455 KC Filter Amplifier Circuit Board Detail and Parts List. EPD-7699
455 KC IF Circuit Board Detail and Parts List EPD-7610
Audio and Squelch Circuit Board Detail and Parts List EPD-7638
Exciter Circuit Board Detail and Parts List EPD-7640
Rectifier and Filter Circuit Boards Detail and Parts List EPD-7643

IMPORTANT
Refer to Instruction Manual 68P81011A45
for descriptive and other service
information.

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE ON THE BACK OF THE CORRESPONDING PRINTED CIRCUIT BOARD DETAILS

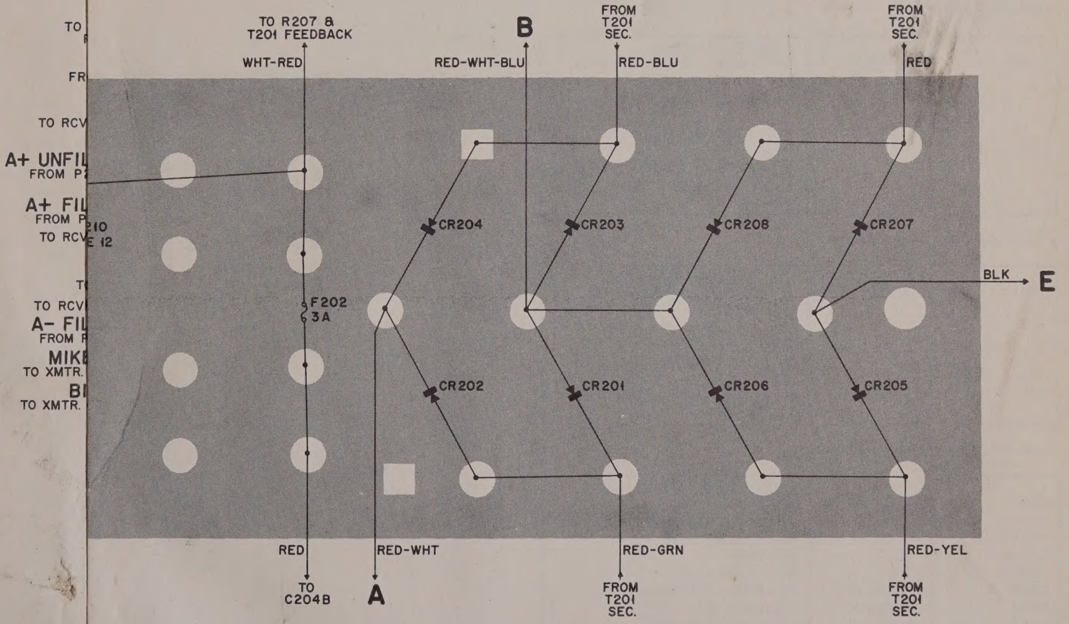
Copyright 1962 by Motorola, Inc.

USED IN
"MOTRAC" DIAGRAM BOOKLET
68P81011A50



400VDC
B++
1
T201
WHT-BLK
WHT
WHT-BRN
RED-GRN
RED-BLU
CR201
CR202
CR
203
CR204
RED-WHT
L201
35MH
RED-WHT
C201A
0.5UF
C201B
0.5UF
R202
470K
2W
RED-YEL
CR
206
CR205
CR207
CR208
RED-WHT-BLU
RED-BLU
L202
300MH
R201
33-2W
R203
47K
2W
C202
25UF
C201D
1UF
P/O
RELAY
K201
2L
1L
RED-BLU
3
B+200VDC
TO TB101-4
R204
8 K
5%,3W
R214
8 K
5%,3W
4
MIC.DC
TO TB101-8
R205
1.5K
1/2W
GRN-WHT
Q201
BRN
202
GRAY
(3 LEADS)
BLK
3
4
GRN
CR209
R206
1.2K
1W
GRN-BLK
5
BIAS-17VDC
TO TB101-6
C203
35UF
R209
1K
1W
GRN
FRO
TO TRANS
RELAY
TO
CRYSTA
P-T
FROM
TO TRANS
RELA
TO NETTIN
FRO
TO TRANS
RELAY
FROM
RSE POLARITY PROTECTION
R SUPPLY.

RECTIFIER BOARD



TO R207 &
T201 FEEDBACK
WHT-RED
B
RED-WHT-BLU
FROM
T201
SEC.
RED-BLU
FROM
T201
SEC.
RED
CR204
CR203
CR208
CR207
BLK
E
F202
3A
CR202
CR201
CR206
CR205
RED
TO
C204B
RED-WHT
A
RED-GRN
FROM
T201
SEC.
RED-YEL
FROM
T201
SEC.
TO
TO RCV
A+ UNFIL
FROM P
A+ FIL
FROM P
TO RCV
210
E 12
TO RCV
A- FIL
FROM
MIKE
TO XMTR.
BI
TO XMTR.
EEPD-7641-O
EEPD-5930-O
EEPD-7648-O
EEPD-5928-O

Rectifier & Filter Circuit Board Details
Model TLN6223A-8 used in 136-174 MC,
25 W, ±12 V, Carrier Squelch
"Motrac" Power Supplies
Motorola No. EPD-7643-O

CONTENTS

Schematic Diagram and Parts List 63E81011A51
A+ & A- Distribution Detail EEPD-7645
Circuit Board Location Details EPD-7687
1st Oscillator Circuit Board Detail and Parts List EPD-7615
8 MC IF Circuit Board Detail and Parts List EPD-7623
2nd Oscillator Circuit Board Detail and Parts List EPD-7619
455 KC Filter Amplifier Circuit Board Detail and Parts List EPD-7699
455 KC IF Circuit Board Detail and Parts List EPD-7610
Audio and Squelch Circuit Board Detail and Parts List EPD-7638
Exciter Circuit Board Detail and Parts List EPD-7640
Rectifier and Filter Circuit Boards Detail and Parts List EPD-7643

IMPORTANT
Refer to Instruction Manual 68P81011A45
for descriptive and other service
information.

PARTS LISTS FOR PRINTED CIRCUIT BOARDS ARE
ON THE BACK OF THE CORRESPONDING PRINTED
CIRCUIT BOARD DETAILS

Copyright 1962 by Motorola, Inc.

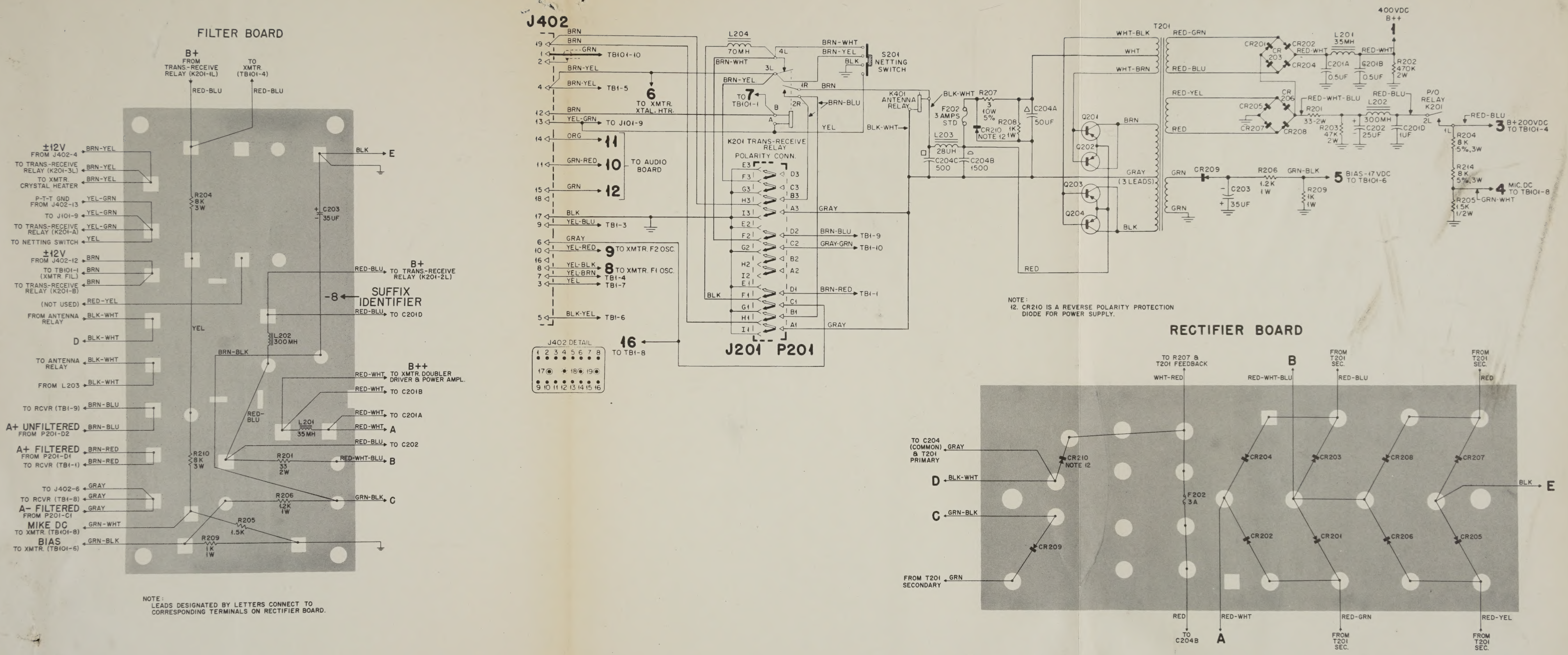
USED IN
"MOTRAC" DIAGRAM BOOKLET
68P81011A50

EEPD-7641-O

EEPD-5930-O

EEPD-7648-O

EEPD-5928-O


FILTER BOARD
B+ FROM TRANS-RECEIVE RELAY (K201-1L)
TO XMTR. (TB101-4)
RED-BLU
±12V FROM J402-4
TO TRANS-RECEIVE RELAY (K201-3L)
TO XMTR. CRYSTAL HEATER
P-T-T GND FROM J402-13
TO J101-9
TO TRANS-RECEIVE RELAY (K201-A)
TO NETTING SWITCH
±12V FROM J402-12
TO TB101-1 (XMTR. FIL.)
TO TRANS-RECEIVE RELAY (K201-B)
(NOT USED)
FROM ANTENNA RELAY
D
TO ANTENNA RELAY
FROM L203
TO RCVR (TB1-9)
A+ UNFILTERED FROM P201-D2
A+ FILTERED FROM P201-D1
TO RCVR (TB1-1)
TO J402-6
TO RCVR (TB1-8)
A- FILTERED FROM P201-C1
MIKE DC TO XMTR. (TB101-8)
BIAS TO XMTR. (TB101-6)
R204 8K 3W
C203 35UF
R210 8K 3W
L202 300MH
L201 35MH
R201 33 2W
R206 1.2K 1W
R205 1.5K
R209 1K 1W
BLK E
B+ TO TRANS-RECEIVE RELAY (K201-2L)
-8 SUFFIX IDENTIFIER
RED-BLU TO C201D
B++ TO XMTR. DOUBLER DRIVER & POWER AMPL.
RED-WHT TO C201B
RED-WHT TO C201A
RED-WHT A
RED-BLU TO C202
RED-WHT-BLU B
GRN-BLK C
NOTE: LEADS DESIGNATED BY LETTERS CONNECT TO CORRESPONDING TERMINALS ON RECTIFIER BOARD.
J402
TB101-10
TB1-5
6 TO XMTR. XTAL. HTR.
TO J101-9
11
10 TO AUDIO BOARD
12
TB1-3
9 TO XMTR. F2 OSC.
8 TO XMTR. F1 OSC.
TB1-4
TB1-7
TB1-6
J402 DETAIL
16 TO TB1-8
L204 70MH
S201 NETTING SWITCH
TO 7 TB101-1
K201 TRANS-RECEIVE RELAY POLARITY CONN.
J201 P201
TB1-9
TB1-10
TB1-1
K401 ANTENNA RELAY
F202 3 AMPS STD
R207 3 10W 5%
CR210 NOTE 12
R208 1K 1W
C204A 50UF
L203 28UH
C204C 500
C204B 1500
Q201
Q202
Q203
Q204
GRAY (3 LEADS)
T201
400VDC B++
CR201
CR202
CR203
CR204
L201 35MH
C201A 0.5UF
C201B 0.5UF
R202 470K 2W
CR205
CR206
CR207
CR208
R201 33-2W
R203 47K 2W
L202 300MH
C202 25UF
C201D 1UF
P/O RELAY K201
3 B+200VDC TO TB101-4
R204 8K 5%,3W
R214 8K 5%,3W
4 MIC.DC TO TB101-8
R205 1.5K 1/2W
CR209
C203 35UF
R206 1.2K 1W
R209 1K 1W
5 BIAS-17VDC TO TB101-6
RED
NOTE:
12. CR210 IS A REVERSE POLARITY PROTECTION DIODE FOR POWER SUPPLY.
RECTIFIER BOARD
TO R207 & T201 FEEDBACK
B
FROM T201 SEC.
TO C204 (COMMON) & T201 PRIMARY
D
C
FROM T201 SECONDARY
F202 3A
E
RED TO C204B
A
RED-WHT
RED-GRN FROM T201 SEC.
RED-YEL FROM T201 SEC.

Rectifier & Filter Circuit Board Details
Model TLN6223A-8 used in 136-174 MC,
25 W, ±12 V, Carrier Squelch
"Motrac" Power Supplies
Motorola No. EPD-7643-O

USED IN
"MOTRAC" DIAGRAM BOOKLET
68P81011A50 68P81011A55

DEPD-6221-O EEPD-7637-O

Audio & Squelch Circuit Board Detail
Models TLN6208A-7 & TLN6221A-7 used in
136-174 MC, ±12 V, Carrier Squelch
"Motrac" Receivers
Motorola No. EPD-7638-O

PARTS LIST
POWER SUPPLY

TPN1010AA POWER SUPPLY, 25 W

TLN6223A Rectifier and Filter Kit; consists of:
1V80702A80 Rectifier Board Assembly
1V80709A36 Filter Board Assembly

1V80702A80 Rectifier Board Assembly EPD-7643-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR201, 202, 203, 204, 205, 206, 207, 208	48D82723C03 or48D82383B04	silicon; 300 v
CR209	48D82723C01 or48D82383B07	silicon; 100 v
CR210	48B865848	silicon

1V80709A36 Filter Board Assembly

		CAPACITOR, fixed:
C203	23C82601A13	35 uf +100-10%; 100 v
		COIL, RF:
L201	25C82379A01	35 mh
L202	25C82380A01	300 mh
		RESISTOR, fixed: ±10%; unl. stated
R201	6R488016	33; 2 w
R204, 210	6C82394D02	8K ±5%; 3 w
R206	6R5770	1.2K; 1 w
R209	6R6327	1K; 1 w

MISCELLANEOUS
(NOT PART OF RECTIFIER & FILTER BOARDS)

		FUSE:
F202	65R20404	3 amp; 250 v

TLN6270A Relay Kit

		RELAY, armature:
K201	80D82197B01	dual stack; 1st stack, 1 form "A" and 1 form "B"; 2nd stack; 1 form "A"; res. 80
		CONNECTOR, plug:
P201		male; 12 cont.; c/o: 14B82337A01 INSULATOR, plug 29C82335A01 TERMINAL, male: 3 req'd

TLN6224A Transformer Kit

		TRANSFORMER, power:
T201	25D82662A01	c/o the following windings: pri.; BRN, BLK with center tap (3) GRAY; sec. No. 1; RED-ORG, RED; sec. No. 2; RED-BLU, RED-GRN; sec. No. 3; GRN, GRN; sec. No. 4; WHT-BLK, WHT-BRN with WHT center tap

TLN6186A Power Supply Chassis

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C201	8D82390A02	3 section; c/o:
C201A		0.5 uf ±20%; 1100 v
C201B		0.5 uf ±20%; 1100 v
C201C		common
C201D		1.0 uf ±20%; 450 v
C202	23K868705	25 uf +50-10%; 450 v
C204	23K868706	3 section; c/o:
C204A		50 uf +50-10%; 25 v
C204B		1500 uf +100-10%; 25 v
C204C		500 uf +250-10%; 25 v
		CONNECTOR, receptacle:
J201		female; 15 cont.; c/o: 14C82338A01 INSULATOR, recp. 29C82336A01 TERMINAL, female: 13 req'd
		COIL, RF:
L203	25C82600A01	28 uh
L204	25B82878A01	choke; 70 mh
		RESISTOR, fixed: ±10%; 2 w; unl. stated
R202	6R2080	470K
R203	6R5736	47K
R207	17C82381A01	3 ±5%; 10 w
R208	6R6327	1K; 1 w
		SWITCH:
S201	40B82786A01	dpst
		SOCKET, transistor:
XQ202, 203, 204, 205	9B82287A01	female; 2 contact

TLN6196A Heat Sink Kit

		TRANSISTOR, (SEE NOTE)
Q201, 202, 203, 204	48A124331	P-N-P
NON-REFERENCED ITEMS		
	15D82215A01	RADIATOR; 2 req'd

TLN6191A Chassis Hardware Kit

		RESISTOR:
R205	6R6038	1.5K ±10%; 1/2 w

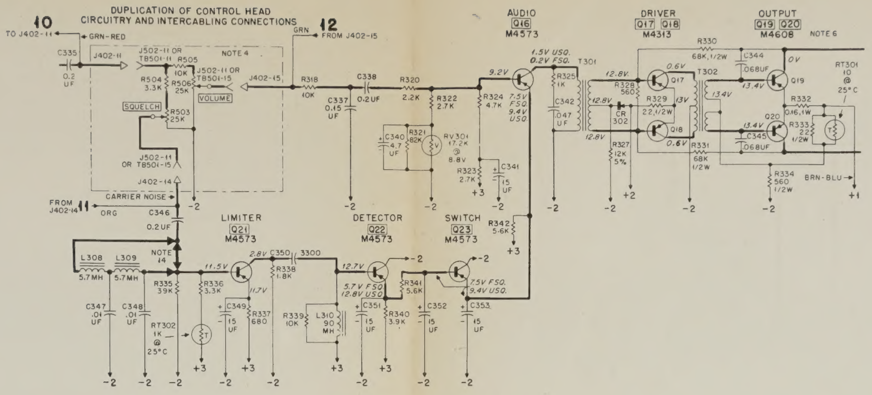
NOTE:

Replacement transistors or diodes must be ordered by Motorola part number only for optimum performance.

USED IN
"MOTRAC" DIAGRAM BOOKLET
68P81011A50 68P81011A55

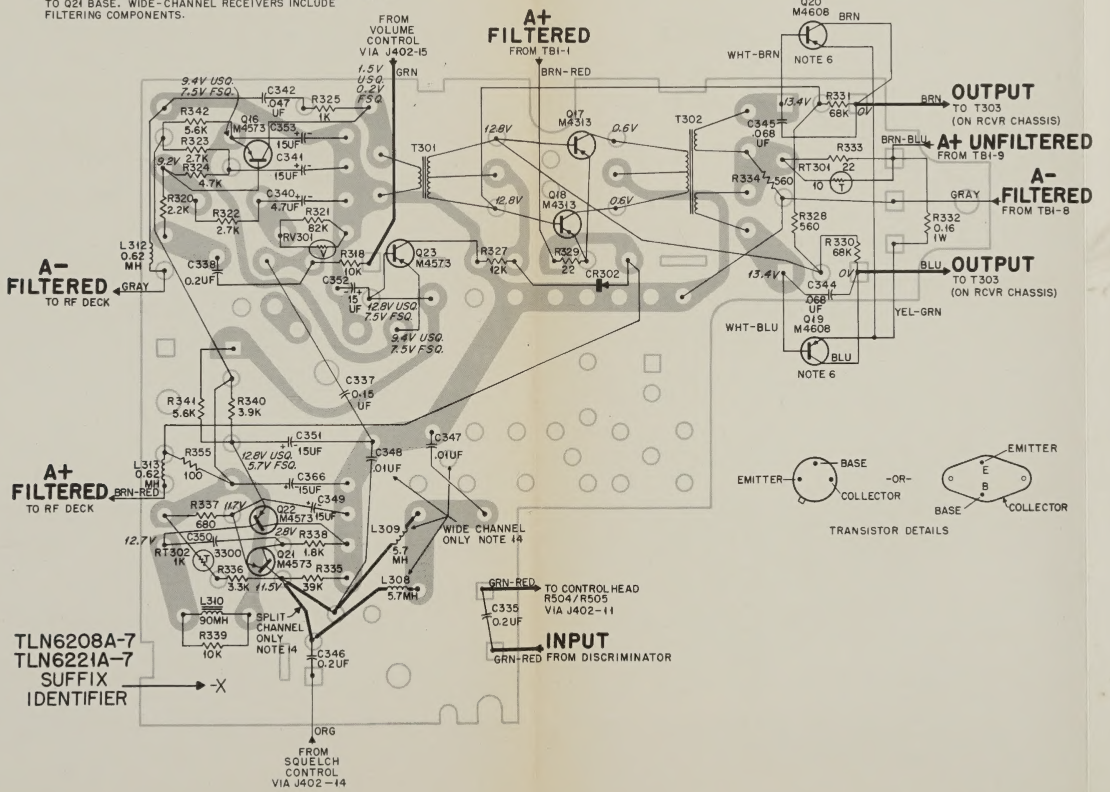
EEPD-7637-O

EEPD-6221-O



10 TO J402-11
DUPLICATION OF CONTROL HEAD CIRCUITRY AND INTERCABLING CONNECTIONS
12 FROM J402-15
NOTE 4
SQUELCH
VOLUME
CARRIER NOISE
FROM J402-14
LIMITER Q21 M4573
DETECTOR Q22 M4573
SWITCH Q23 M4573
AUDIO Q16 M4573
DRIVER Q17 Q18 M4313
OUTPUT Q19 Q20 M4608
NOTE 6
NOTE 14
T301
T302
RT301 10 @ 25°C
RT302 1K @ 25°C
BRN-BLU
GRN-RED
ORG
GRN

NOTE:
4. PART OF CONTROL HEAD CIRCUITRY IS DUPLICATED IN RECEIVER SCHEMATIC.
6. Q19 & Q20 ARE LOCATED BEHIND FRONT PANEL.
7. USQ=RECEIVER UNSQUELCHED.
FSQ=RECEIVER FULLY SQUELCHED.
14. IN SPLIT-CHANNEL RECEIVERS, C346 IS CONNECTED DIRECTLY TO Q21 BASE. WIDE-CHANNEL RECEIVERS INCLUDE FILTERING COMPONENTS.



FROM VOLUME CONTROL VIA J402-15
A+ FILTERED FROM TB1-1
BRN-RED
Q20 M4608
BRN
WHT-BRN
NOTE 6
OUTPUT TO T303 (ON RCVR CHASSIS)
A+ UNFILTERED FROM TB1-9
A- FILTERED FROM TB1-8
GRAY
OUTPUT TO T303 (ON RCVR CHASSIS)
YEL-GRN
WHT-BLU
Q19 M4608
BLU
NOTE 6
A- FILTERED TO RF DECK
A+ FILTERED TO RF DECK
WIDE CHANNEL ONLY NOTE 14
SPLIT CHANNEL ONLY NOTE 14
TO CONTROL HEAD R504/R505 VIA J402-11
GRN-RED
INPUT FROM DISCRIMINATOR
TLN6208A-7
TLN6221A-7
SUFFIX IDENTIFIER
-X
ORG
FROM SQUELCH CONTROL VIA J402-14
EMITTER
BASE
COLLECTOR
-OR-
E
B
TRANSISTOR DETAILS

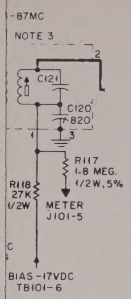
Audio & Squelch Circuit Board Detail
Models TLN6208A-7 & TLN6221A-7 used in 136-174 MC, ±12 V, Carrier Squelch "Motrac" Receivers
Motorola No. EPD-7638-O

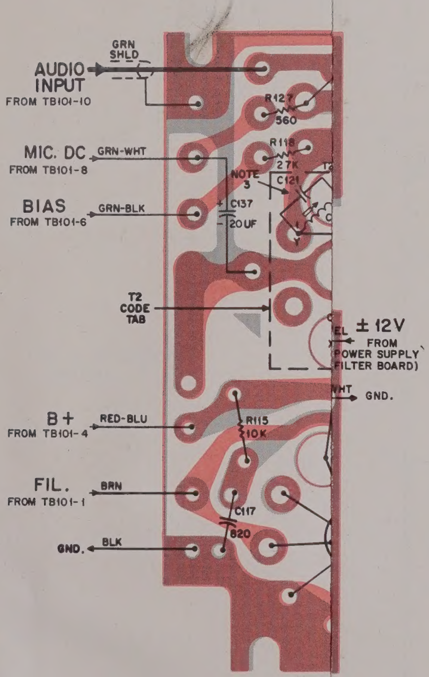
DEPD-7639-O

DEPD-7454-O

DEPD-7455-O

USED IN
"MOTRAC" DIAGRAM BOOKLETS
68P81011A50, 68P81011A55


-87MC
NOTE 3
2
C121
C120
820
3
R117
1.8 MEG.
1/2W, 5%
R118
27K
1/2W
METER
J101-5
C
BIAS -17VDC
TB101-6


GRN
SHLD
AUDIO
INPUT
FROM TB101-10
R127
560
MIC. DC
FROM TB101-8
GRN-WHT
R118
27K
NOTE
3
C121
BIAS
FROM TB101-6
GRN-BLK
C137
20UF
T2
CODE
TAB
± 12V
FROM
(POWER SUPPLY
FILTER BOARD)
GND.
B+
FROM TB101-4
RED-BLU
R115
10K
FIL.
FROM TB101-1
BRN
C117
820
GND.
BLK

Exciter Circuit Board Detail
Models TLD6160A-10, TLD6170A-13 & TLD6210A-3
Used in 132-174 MC, ±12V, Carrier Squelch
"Motrac" Transmitters
Motorola No. EPD-7640-O

PARTS LIST

TLN6208A Audio & Squelch Board (Wide Channel)
TLN6221A Audio & Squelch Board (Split Channel) EPD-7638-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uf; ±10%; 200 v; unl. stated
C335, 338, 346	8R127402	0.2 ±30%; 50 v
C337	8K865659	0.15 ±20%
C340	23K865137	4.7 ±20%
C341, 349, 351, 352, 353, 366	23K865136	15 ±20%; 25 v
C342	8K857472	.047
C344, 345	8C82427B01	.068; 50 v
C347, 348	8K857473	.01 (wide channel only)
C350	8K861939	3300 uuf; 100 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR302	48C82178A06	germanium
		COIL, RF:
L308, 309	24K864763	5.7 mh; BLK-RED (wide channel only)
L312, 313	24K864737	0.62 mh; BLK-BRN
		REACTOR,
L310	25B82738C01	choke; 90 mh; 60 ohm
		TRANSISTOR, (SEE NOTE)
Q16, 21, 22, 23	48R134573	P-N-P; type M4573
Q17, 18	48A124313	P-N-P; type M4313
		RESISTOR, fixed: ±10%; 1/4 w; unl. stated
R318, 339	6K129225	10K
R320	6K128689	2.2K
R321	6K129145	82K
R322, 323	6K128688	2.7K
R324	6K127804	4.7K
R325	6K127802	1K
R327	6K129887	12K ±5%
R328	6K129620	560
R329, 333	6R6406	22; 1/2 w
R330, 331	6R6074	68K; 1/2 w
R332	17C82350A05	0.16; 1 w
R334	6R6291	560; 1/2 w
R335	6K128903	39K
R336	6K129231	3.3K
R337	6K128599	680
R338	6K129269	1.8K
R340	6K129232	3.9K
R341, 342	6K129433	5.6K
R355	6K129753	100
		THERMISTOR,
RT301	6B82769A01	10 ohms
RT302	6B858402	1K ohms
		VARISTOR,
RV301	6B858401	17.2K @ 8.8 v
		TRANSFORMER,
T301	25C852298	pri: res. 330; sec: res. 7; tapped
T302	25C852299	pri: res. 670; tapped; sec: res. 13; split winding

NOTE:

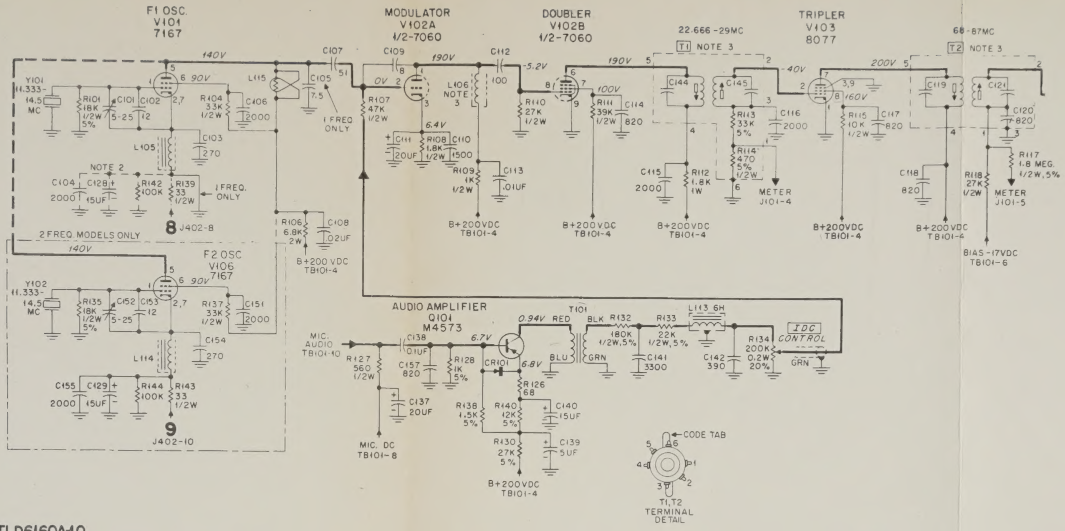
Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

DEPD-7639-O

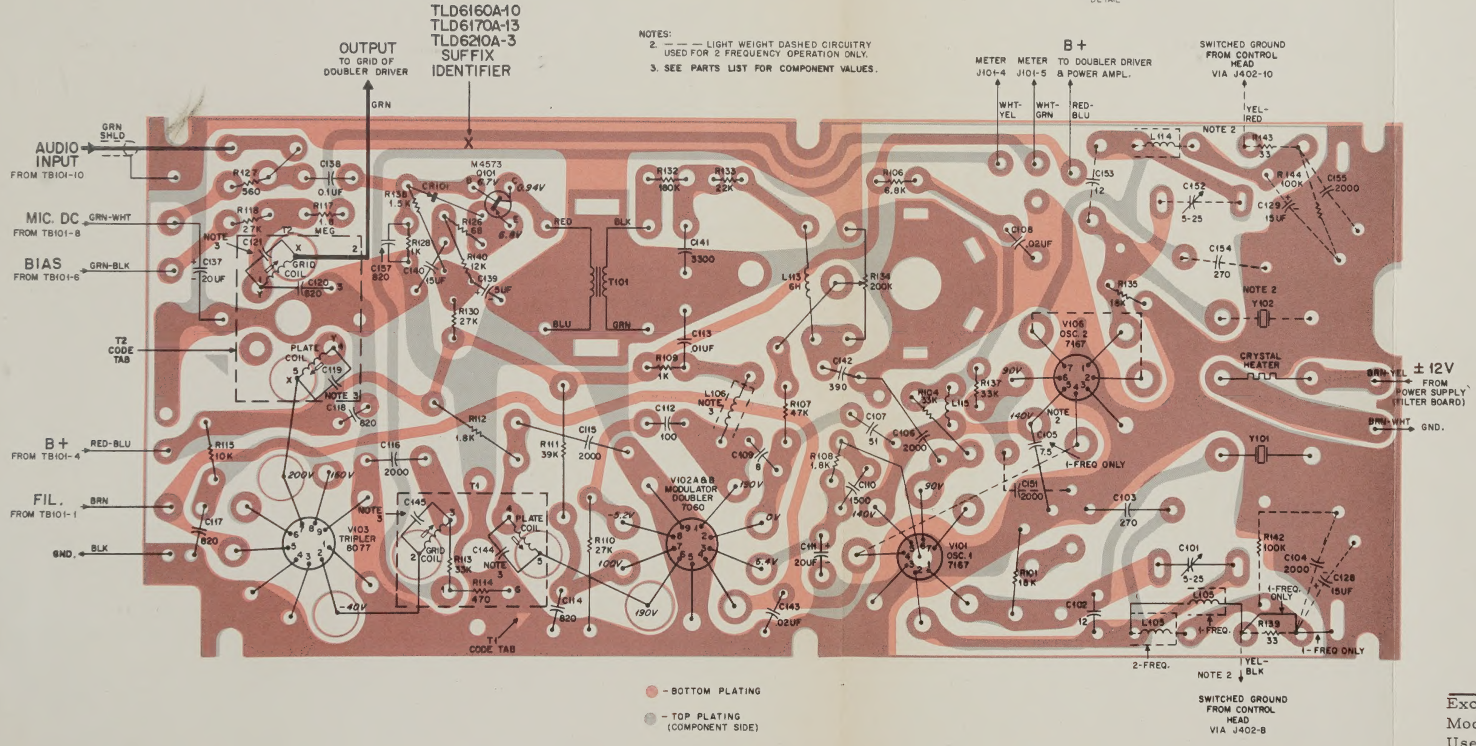
DEPD-7454-O

DEPD-7455-O

USED IN
"MOTRAC" DIAGRAM BOOKLETS
68P81011A50, 68P81011A55



F1 OSC.
V101
7167
MODULATOR
V102A
1/2-7060
DOUBLER
V102B
1/2-7060
22.666-29MC
T1 NOTE 3
TRIPLER
V103
8077
68-87MC
T2 NOTE 3
Y101 11.333-14.5 MC
2 FREQ MODELS ONLY
F2 OSC
V106
7167
Y102 11.333-14.5 MC
8 J402-8
9 J402-10
1 FREQ. ONLY
B+200 VDC TB101-4
AUDIO AMPLIFIER
Q101
M4573
MIC. AUDIO TB101-10
MIC. DC TB101-8
IDC CONTROL
METER J101-4
METER J101-5
BIAS -17VDC TB101-6
CODE TAB
T1,T2 TERMINAL DETAIL



TLD6160A-10
TLD6170A-13
TLD6210A-3
SUFFIX IDENTIFIER
OUTPUT
TO GRID OF DOUBLER DRIVER
AUDIO INPUT FROM TB101-10
MIC. DC FROM TB101-8
BIAS FROM TB101-6
T2 CODE TAB
B+ FROM TB101-4
FIL. FROM TB101-1
GND.
B+
METER J101-4
METER J101-5
TO DOUBLER DRIVER & POWER AMPL.
SWITCHED GROUND FROM CONTROL HEAD VIA J402-10
± 12V FROM POWER SUPPLY (FILTER BOARD)
GND.
CRYSTAL HEATER
V106 OSC. 2 7167
V101 OSC. 1 7167
V102A&B MODULATOR DOUBLER 7060
V103 TRIPLER 8077
T1 CODE TAB
SWITCHED GROUND FROM CONTROL HEAD VIA J402-8

NOTES:
2. — — — LIGHT WEIGHT DASHED CIRCUITRY USED FOR 2 FREQUENCY OPERATION ONLY.
3. SEE PARTS LIST FOR COMPONENT VALUES.

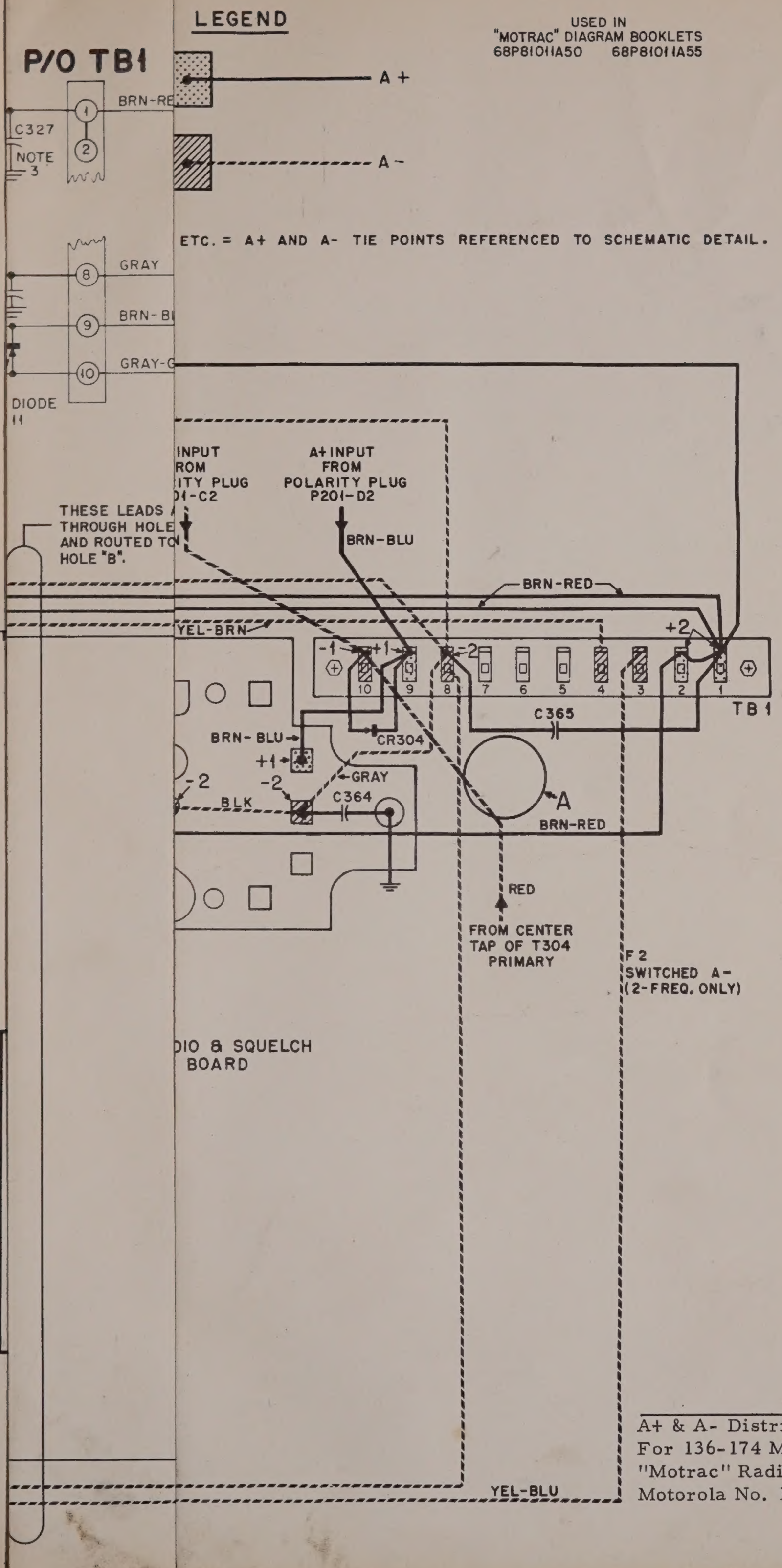
● - BOTTOM PLATING
● - TOP PLATING (COMPONENT SIDE)

USED WITH PARTIAL SCHEMATIC OF DIAGRAM NO.
63E81011A51, A56

Exciter Circuit Board Detail
Models TLD6160A-10, TLD6170A-13 & TLD6210A-3
Used in 132-174 MC, ±12V, Carrier Squelch
"Motrac" Transmitters
Motorola No. EPD-7640-O

p/o 63E81011A51-O

USED IN
"MOTRAC" DIAGRAM BOOKLETS
68P81011A50 68P81011A55


P/O TB1
C327
NOTE 3
DIODE 11
BRN-RE
GRAY
BRN-BI
GRAY-G
LEGEND
A +
A −
ETC. = A+ AND A- TIE POINTS REFERENCED TO SCHEMATIC DETAIL.
INPUT
ROM
ITY PLUG
01-C2
A+ INPUT FROM POLARITY PLUG P201-D2
THESE LEADS A
THROUGH HOLE
AND ROUTED TO
HOLE "B".
BRN-BLU
BRN-RED
YEL-BRN
+2
-1
+1
-2
10
9
8
7
6
5
4
3
2
1
TB 1
C365
BRN-BLU
CR304
+1
-2
-2
GRAY
BLK
C364
A
BRN-RED
RED
FROM CENTER TAP OF T304 PRIMARY
F 2
SWITCHED A−
(2-FREQ. ONLY)
DIO & SQUELCH
BOARD
YEL-BLU

A+ & A- Distribution Detail
For 136-174 MC, ±12 V, Carrier Squelch
"Motrac" Radio Sets
Motorola No. EEPD-7645-O

PARTS LIST

TLD6210A Exciter Board Kit (1-Freq) 136-150.8 MC
TLD6160A Exciter Board Kit (1-Freq) 150.8-174 MC
TLD6170A Exciter Board Kit (2-Freq) 150-174 MC EPD-7640-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf ±10%; 500 v; unl. stated
C101, 152	20K859643	var; 5-25; NP0
C102, 153	21K847874	12 ±5%; NP0
C103, 154	21K859178	270 ±5%; 300 v
C104, 106, 115, 116, 151, 155	21K837746	2000
C105	21K857337	7.5 ±.5 uuf; NP0 (1-freq. only)
C107	21K840711	51 ±5%
C108	21B401029	.02 uf +80-20%; 600 v
C109	21K847743	8 ±.5 uuf; NP0
C110	21B800801	1500; GMV +100% max.
C111	23C844927	20 uf +100-10%; 25 v
	or23C82601A03	20 uf +100-0%; 25 v
C112	21K850118	100 ±5%
C113	21B801139	.01 uf +80-20%; 600 v
C114, 117, 118, 120, 157	21B837745	820
C119	21D82355B19	6 ±5%; N470 (150.8-174 mc)
	or21K840811	10 ±5%; N470 (136-150.8 mc)
C121	21K849332	3 ±.25 uuf; N750 (150.8-174 mc)
	or21K859216	8.2 ±.25 uuf; N470 (136-150.8 mc)
C128, 129, 140	23K865136	15 uf ±20%; 25 v
C137	23C82601A03	20 uf +100-0%; 25 v
C138	8K864428	0.1 uf; 100 v
C139	23K867670	5 uf +100-10%; 25 v
C141	21K857334	3300
C142	21K848158	390; 300 v
C143	21C82606A01	.02 uf +60-40%; 100 v
C144	21K864739	12 ±5%; N470 (136-150.8 mc)
	or21K861749	16 ±5%; 250 v; N470 (150.8-174 mc)
C145	21D82355B19	6 ±5%; N470; (136-150.8 mc)
	or21K864739	12 ±5%; N470; (150.8-174 mc)
		SEMICONDUCTOR DEVICE, diode: (NOTE I)
CR101	48B857965	silicon
		COIL, RF:
L105, 114	24V80900A15	choke; shl'd; .62 mh; BLK-BRN
L106	24V80901A23	choke; shl'd; BRN; 10.5 uh (150.8-174 mc)
	or24V80900A42	choke; shl'd; RED-YEL; 16.0 uh (136-150.8 mc)
L113	25C82867C01	choke; a-f; 6 h
L115	24D82480B01	suppressor; RED-ORG
		TRANSISTOR, P-N-P; (NOTE I)
Q101	48R134573	germanium; type M4573
		RESISTOR, fixed: ±10%; 1/2 w; unl. stated
R101, 135	6R488095	18K ±5%
R104, 137	6R6410	33K
R106	6R5690	6.8K; 2 w
R107	6R6048	47K
R108	6R2089	1.8K
R109	6R6229	1K
R110, 118	6R6434	27K
R111	6R6487	39K
R112	6R5620	1.8K; 1 w
R113	6R129526	33K ±5%; 1/4 w
R114	6S400812	470 ±5%
R115	6S6320	10K
R117	6R401017	1.8 meg ±5%
R126	6K129861	68; 1/4 w
R127	6R400058	560 ±5%
R128	6K129805	1K ±5%; 1/4 w
R130	6R488187	27K ±5%; 2 w
R132	6R2061	180K ±5%
R133	6R6480	22K ±5%
R134	18C855155	var; 200K ±20%
R138	6K129681	1.5K ±5%; 1/4 w
R139, 143	6R2036	33
R140	6K129887	12K ±5%; 1/4 w
R142, 144	6K129226	100K; 1/4 w
		TRANSFORMER, RF:
T1	24B82171D01	dblr coil; incl. C144, 145, R113, 114 and (2) 1A82354B03 CORE, tuning: RED (150.8-174 mc)
	or24V80901A37	dblr coil; incl. C144, 145, R113, 114 and (2) 1A82354B03 CORE, tuning: RED (136-150.8 mc)
T2	24B82165D01	tripler coil; incl. C119, 120, 121 and (2) 1A82354B04 CORE, tuning: RED (150.8-174 mc)
	or24B82246D01	tripler coil; incl. C119, 120, 121 and (2) 1A82354B04 CORE, tuning: RED (136-150.8 mc)
		TRANSFORMER, AF:
T101	25C837249	pri: RED-BLU; res 1020 sec: GRN-BLK; res 7100
		ELECTRON, TUBE:
V101, 106	95T277A01	type 7167
V102	95T276A01	type 7060
V103	95T319A01	type 8077
		CRYSTAL UNIT, quartz: (NOTE II)
V101	ZNN-3A	xmtr. control (1-freq.)
Y102	ZNN-3-3A	xmtr. control (2-freq.) incl. Y101
		SOCKET, tube:
XV101, 201	9C857351	7 contact
XV102, 103	9C858152	9 contact
		SOCKET, crystal:
XY101, 102	9C855941	6 contact

NOTES:

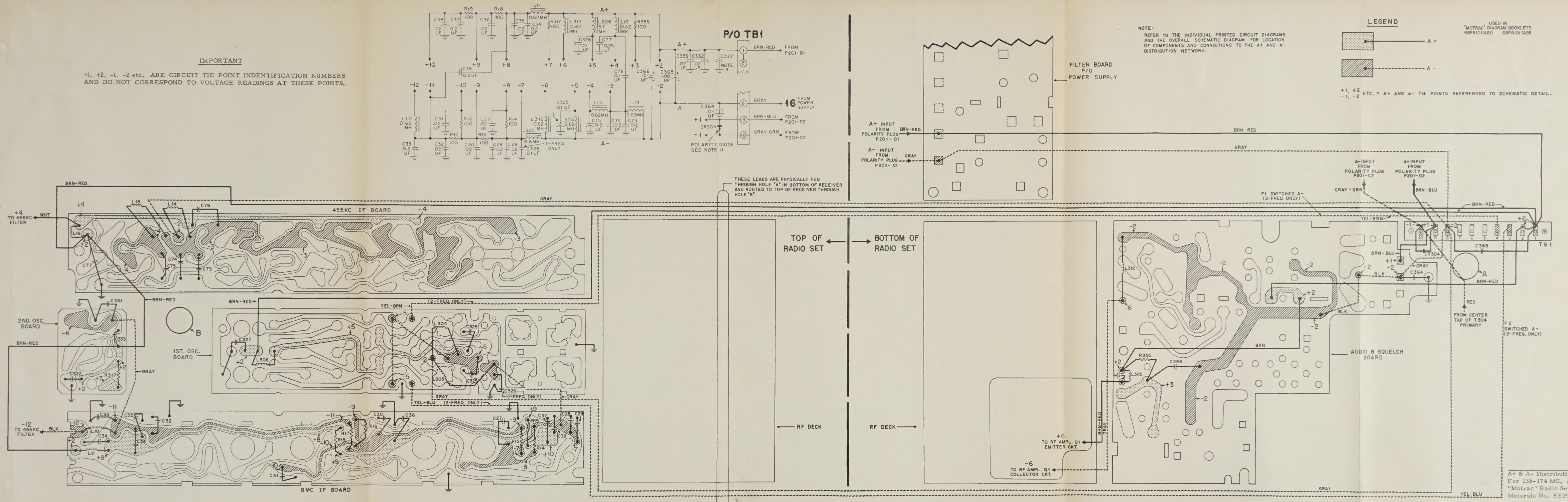
I. Replacement transistors must be ordered by Motorola part number only for optimum performance.

II. When ordering xtal units specify car. freq(s), xtal freq(s) and xtal type no. Xtals are part of the Radio Set Model. When ordering an EXCITER CIRCUIT BD, xtals must be ordered separately.

p/o 63E81011A51-O

IMPORTANT

+1, +2, -1, -2 etc. ARE CIRCUIT TIE POINT INDENTIFICATION NUMBERS AND DO NOT CORRESPOND TO VOLTAGE READINGS AT THESE POINTS.


P/O TB1
A+
A-
BRN-RED FROM P201-D1
GRAY 16 FROM POWER SUPPLY
BRN-BLU FROM P201-D2
GRAY-GRN FROM P201-C2
C333 .02 UF
C332 .02 UF
C327 NOTE 3
C364 .01 UF
CR304
POLARITY DIODE SEE NOTE 11
C366 15 UF
C365 100 UF
R355 100
THESE LEADS ARE PHYSICALLY FED THROUGH HOLE "A" IN BOTTOM OF RECEIVER AND ROUTED TO TOP OF RECEIVER THROUGH HOLE "B".
FILTER BOARD P/O POWER SUPPLY
A+ INPUT FROM POLARITY PLUG P201-D1
A- INPUT FROM POLARITY PLUG P201-C1
BRN-RED
GRAY
455KC IF BOARD
+4 TO 455KC FILTER
WHT
2ND. OSC. BOARD
1ST. OSC. BOARD
B
YEL-BRN
(2-FREQ. ONLY)
(1-FREQ. ONLY)
YEL-BLU
-12 TO 455KC FILTER
BLK
8MC IF BOARD
TOP OF RADIO SET
BOTTOM OF RADIO SET
RF DECK
+6 TO RF AMPL. Q1 EMITTER CKT.
-6 TO RF AMPL. Q1 COLLECTOR CKT.
AUDIO & SQUELCH BOARD
A-INPUT FROM POLARITY PLUG P201-C2
A+INPUT FROM POLARITY PLUG P201-D2
GRAY-GRN
BRN-BLU
F1 SWITCHED A- (1-FREQ. ONLY)
F2 SWITCHED A- (2-FREQ. ONLY)
FROM CENTER TAP OF T304 PRIMARY
RED
BRN
TB1
A

NOTE:
REFER TO THE INDIVIDUAL PRINTED CIRCUIT DIAGRAMS AND THE OVERALL SCHEMATIC DIAGRAM FOR LOCATION OF COMPONENTS AND CONNECTIONS TO THE A+ AND A- DISTRIBUTION NETWORK.

LEGEND

- ░ ——— A +
- ▨ - - - - A -

+1, +2
-1, -2 ETC. = A+ AND A- TIE POINTS REFERENCED TO SCHEMATIC DETAIL.

USED IN
"MOTRAC" DIAGRAM BOOKLETS
68P81011A50 68P81011A55

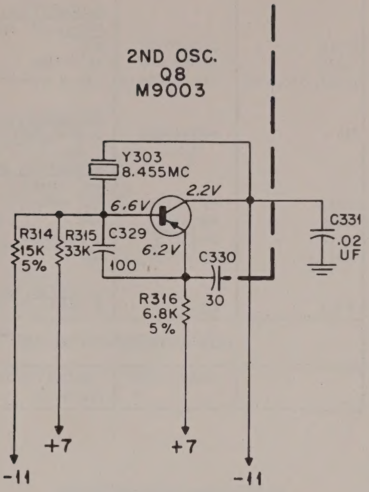
A+ & A- Distribution Detail
For 136-174 MC, ±12 V, Carrier Squelch
"Motrac" Radio Sets
Motorola No. EEPD-7645-O

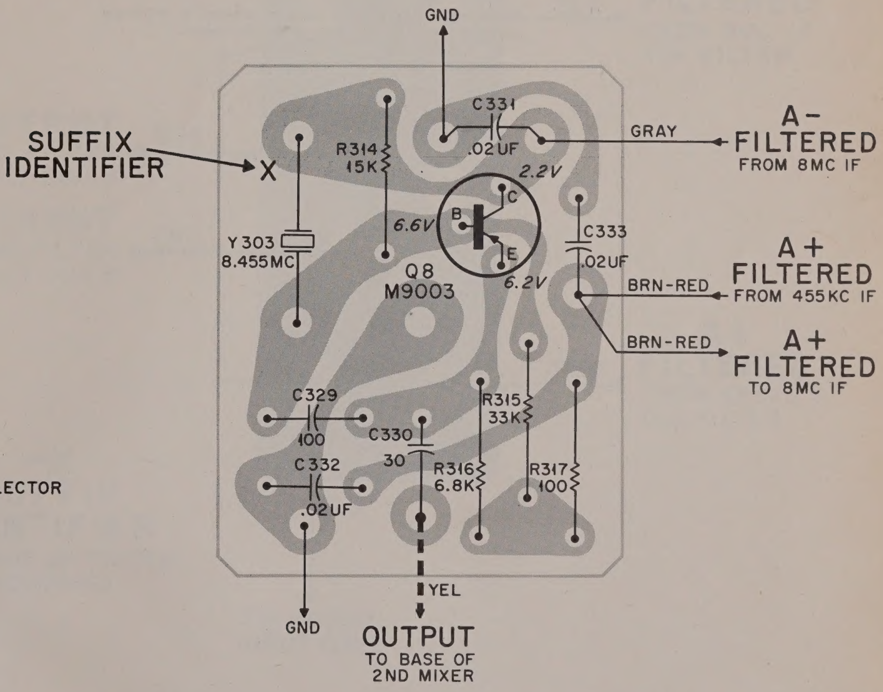
USED IN
"MOTRAC" DIAGRAM BOOKLETS

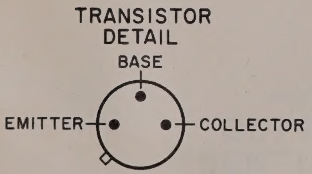
68P81011A50
68P81011A55
68P81011A60
68P81011A65
68P81011A70
68P81011A75
68P81011A80
68P81011A90
68P81011A95

BEPD-7617-O

BEPD-7616-O


2ND OSC.
Q8
M9003
Y303
8.455MC
6.6V
2.2V
R314
15K
5%
R315
33K
C329
100
6.2V
C330
30
C331
.02
UF
R316
6.8K
5%
+7
+7
-11
-11


GND
C331
.02UF
GRAY
A-
FILTERED
FROM 8MC IF
SUFFIX
IDENTIFIER
X
R314
15K
2.2V
C
B
6.6V
E
C333
.02UF
Y303
8.455MC
Q8
M9003
6.2V
A+
FILTERED
FROM 455KC IF
BRN-RED
BRN-RED
A+
FILTERED
TO 8MC IF
C329
100
R315
33K
C330
30
C332
.02UF
R316
6.8K
R317
100
GND
YEL
OUTPUT
TO BASE OF
2ND MIXER


TRANSISTOR
DETAIL
BASE
EMITTER
COLLECTOR

2nd Oscillator Circuit Board Detail
Model TLN6483A
136-174 MC, "Motrac" Receivers
Motorola No. EPD-7619-O

PARTS LIST

TLN6483A 2nd Oscillator Board EPD-7619-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf ±5%; 500 v; unl. stated
C329	21K850118	100
C330	21K872060	30; N1500
C331, 332, 333	21D82428B18	.02 uf +60-40%; 250 v
		TRANSISTOR, (SEE NOTE)
Q8	48R869003	P-N-P; type M9003
		RESISTOR, fixed: ±10%; 1/4 w; unl. stated
R314	6K129236	15K ±5%
R315	6K127807	33K
R316	6K129237	6.8K ±5%
R317	6K129753	100
		CRYSTAL UNIT, quartz
Y303	G09	8.455 mc
NON-REFERENCED ITEMS		
	1V80721A76	CIRCUIT BOARD ASSY. (eyeleted)

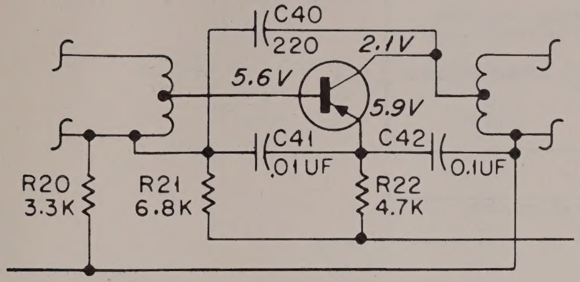
NOTE:

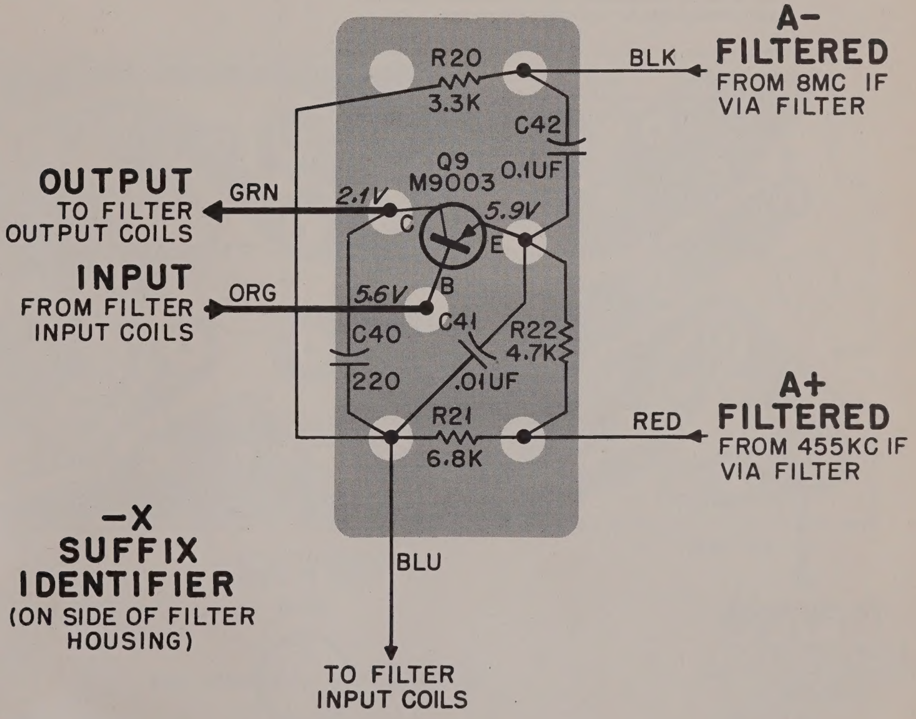
Replacement transistors must be ordered by Motorola part number only for optimum performance.

USED IN
"MOTRAC" DIAGRAM BOOKLETS

68P81011A50	68P81011A75
68P81011A55	68P81011A80
68P81011A60	68P81011A90
68P81011A65	68P81011A95
68P81011A70	

455KC AMPL.
Q9
M9003


C40
220
2.1V
5.6V
5.9V
C41
.01UF
C42
0.1UF
R20
3.3K
R21
6.8K
R22
4.7K


R20
3.3K
BLK
A-
FILTERED
FROM 8MC IF
VIA FILTER
C42
0.1UF
Q9
M9003
OUTPUT
TO FILTER
OUTPUT COILS
GRN
2.1V
C
5.9V
E
INPUT
FROM FILTER
INPUT COILS
ORG
5.6V
B
C41
R22
4.7K
C40
220
.01UF
R21
6.8K
RED
A+
FILTERED
FROM 455KC IF
VIA FILTER
-X
SUFFIX
IDENTIFIER
(ON SIDE OF FILTER
HOUSING)
BLU
TO FILTER
INPUT COILS

BEPD-7697-O BEPD-7698-O

455 KC Filter Amplifier Circuit Board Detail
P/O Model TFN6013AS & TFN6013AW IF Filters
Used in 136-174 MC, "Motrac" Receivers
Motorola No. EPD-7699-O

PARTS LIST

1V80721A77 455 KC Filter Amplifier Board EPD-7699-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C40	21D82428B20	220 uuf ±20%; 100 v
C41	21D82428B19	.01 uf ±20%; 100 v
C42	21C82372C01	0.1 uf +80-20%; 25 v
		TRANSISTOR, (SEE NOTE)
Q9	48R869003	P-N-P; type M9003
		RESISTOR, fixed: ±10%; 1/4 w; unl stated
R20	6K129231	3.3K
R21	6K128687	6.8K
R22	6K127804	4.7K
NON-REFERENCED ITEMS		
	1V80721A78	CIRCUIT BOARD ASSY. (eyeleted)

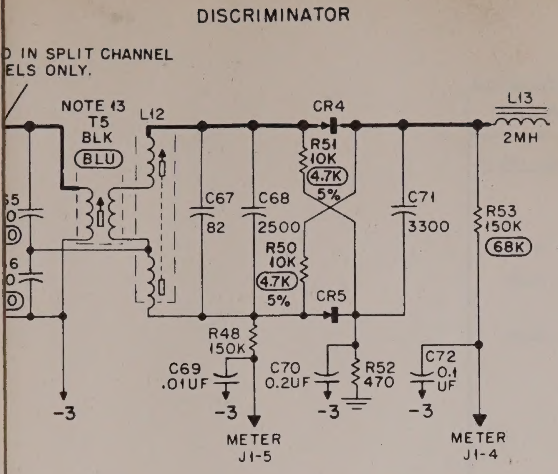
NOTE:

Replacement transistors must be ordered by Motorola part number only for optimum performance.

USED IN
"MOTRAC" DIAGRAM BOOKLETS
68P81011A50 68P81011A70
68P81011A55 68P81011A80

DEPD-6373-D

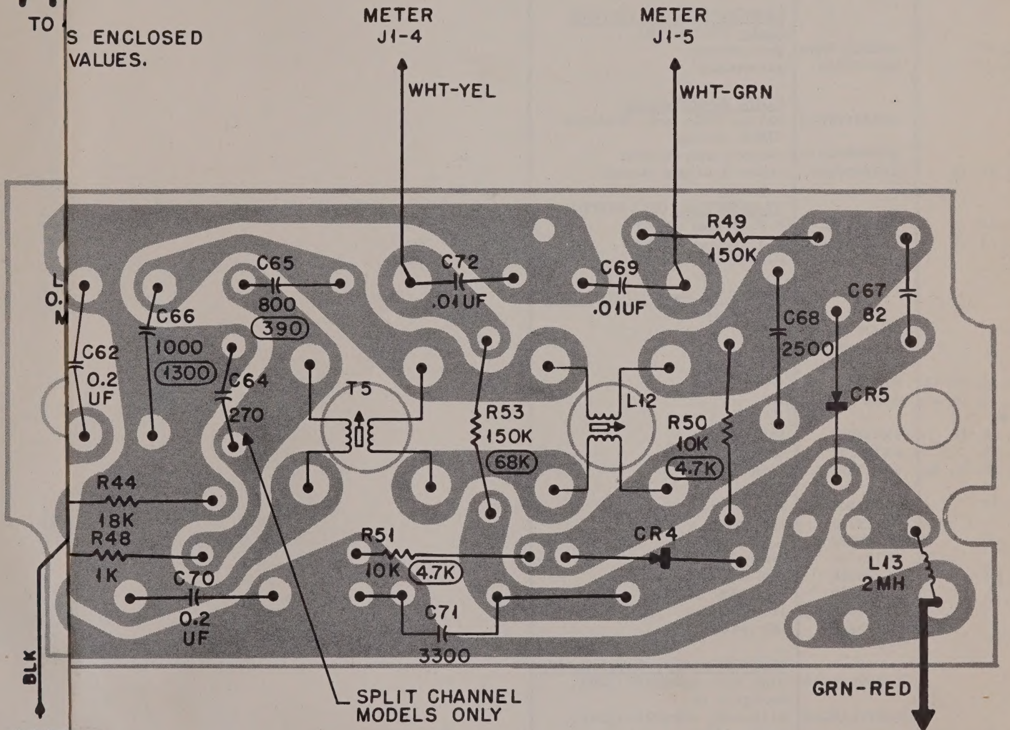
DEPD-7609-O


DISCRIMINATOR
D IN SPLIT CHANNEL
ELS ONLY.
NOTE 13
T5
BLK
BLU
L12
CR4
L13
2MH
R51
10K
4.7K
5%
C67
82
C68
2500
R50
10K
4.7K
5%
C71
3300
R53
150K
68K
CR5
R48
150K
C69
.01UF
C70
0.2UF
R52
470
C72
0.1
UF
-3
-3
-3
-3
METER
J1-5
METER
J1-4

FI

TO

S ENCLOSED
VALUES.


METER
J1-4
WHT-YEL
METER
J1-5
WHT-GRN
L
0.
M
C65
800
390
C72
.01UF
C69
.01UF
R49
150K
C67
82
C66
1000
1300
C68
2500
C62
0.2
UF
C64
270
T5
L12
R53
150K
68K
R50
10K
4.7K
CR5
R44
18K
R48
1K
R51
10K
4.7K
CR4
L13
2MH
C70
0.2
UF
C71
3300
BLK
SPLIT CHANNEL
MODELS ONLY
GRN-RED

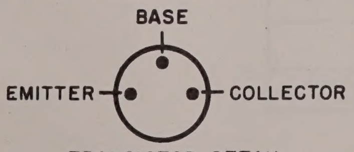
INF

FROM

FIL

OUTPUT

TO CONTROL HEAD
VIA AUDIO & SQUELCH
BOARD


BASE
EMITTER
COLLECTOR

TRANSISTOR DETAIL

455 KC IF Circuit Board Detail
Model TLN6480AS & TLN6480AW used in
136-174 MC "Motrac" Receivers
Motorola No. EPD-7610-O

PARTS LIST

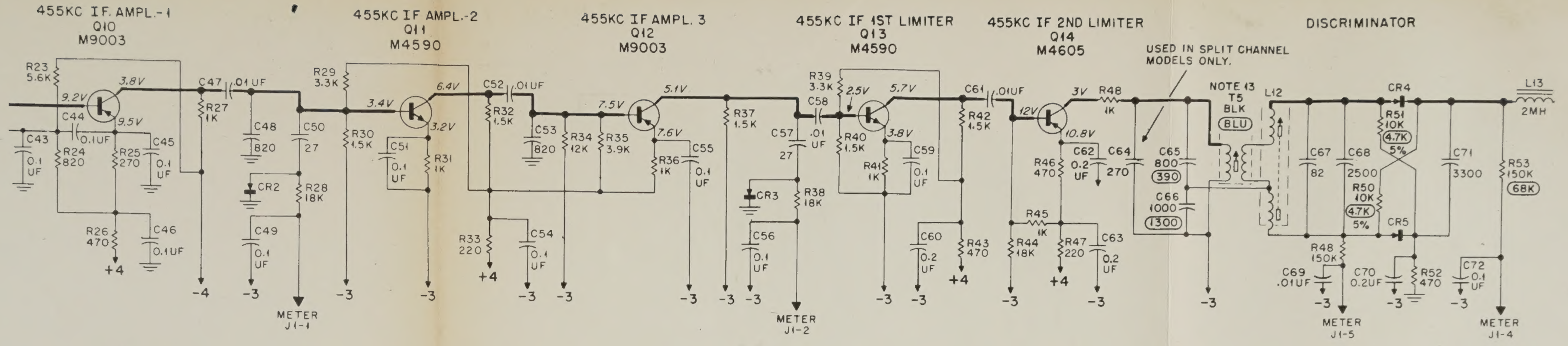
1V80721A77 455 KC Filter Amplifier Board EPD-7699-O

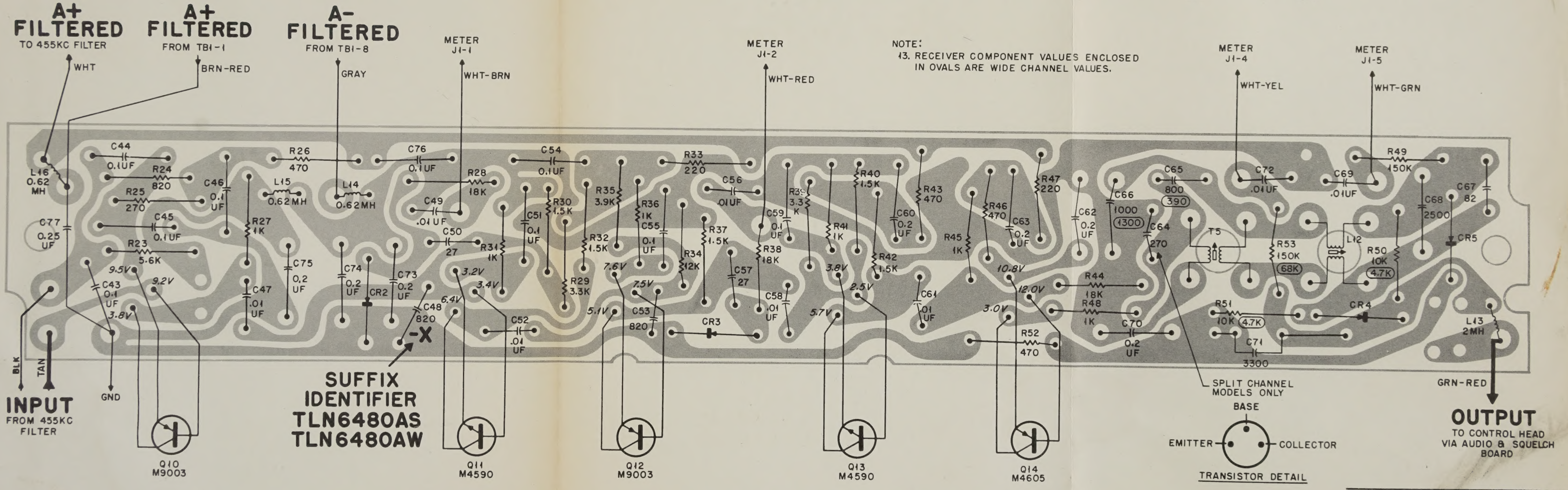
REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed:
C40	21D82428B20	220 uuf ±20%; 100 v
C41	21D82428B19	.01 uf ±20%; 100 v
C42	21C82372C01	0. 1 uf +80-20%; 25 v
		TRANSISTOR, (SEE NOTE)
Q9	48R869003	P-N-P; type M9003
		RESISTOR, fixed: ±10%; 1/4 w; unl stated
R20	6K129231	3. 3K
R21	6K128687	6. 8K
R22	6K127804	4. 7K
NON-REFERENCED ITEMS		
	1V80721A78	CIRCUIT BOARD ASSY. (eyeleted)

NOTE:

Replacement transistors must be ordered by Motorola part number only for optimum performance.

"MOTRAC" DIAGRAM BOOKLETS USED IN
68P81011A50 68P81011A70
68P81011A55 68P81011A80


455KC I.F. AMPL.-1
Q10
M9003
455KC IF AMPL.-2
Q11
M4590
455KC IF AMPL. 3
Q12
M9003
455KC IF 1ST LIMITER
Q13
M4590
455KC IF 2ND LIMITER
Q14
M4605
DISCRIMINATOR
USED IN SPLIT CHANNEL MODELS ONLY.
NOTE 13
T5
BLK
BLU
L12
L13
2MH
CR4
CR5
R23 5.6K
R24 820
R25 270
R26 470
R27 1K
R28 18K
R29 3.3K
R30 1.5K
R31 1K
R32 1.5K
R33 220
R34 12K
R35 3.9K
R36 1K
R37 1.5K
R38 18K
R39 3.3K
R40 1.5K
R41 1K
R42 1.5K
R43 470
R44 18K
R45 1K
R46 470
R47 220
R48 1K
R48 150K
R50 10K 4.7K 5%
R51 10K 4.7K 5%
R52 470
R53 150K 68K
C43 0.1 UF
C44 0.1UF
C45 0.1 UF
C46 0.1UF
C47 .01 UF
C48 820
C49 0.1 UF
C50 27
C51 0.1 UF
C52 .01UF
C53 820
C54 0.1 UF
C55 0.1 UF
C56 0.1 UF
C57 .01 UF 27
C58
C59 0.1 UF
C60 0.2 UF
C61 .01UF
C62 0.2 UF
C63 0.2 UF
C64 270
C65 800 390
C66 1000 1300
C67 82
C68 2500
C69 .01UF
C70 0.2UF
C71 3300
C72 0.1 UF
CR2
CR3
3.8V
9.2V
9.5V
6.4V
3.4V
3.2V
7.5V
5.1V
7.6V
2.5V
5.7V
3.8V
3V
12V
10.8V
+4
-4
-3
METER J1-1
METER J1-2
METER J1-5
METER J1-4


A+ FILTERED
TO 455KC FILTER
WHT
A+ FILTERED
FROM TB1-1
BRN-RED
A- FILTERED
FROM TB1-8
GRAY
METER J1-1
WHT-BRN
METER J1-2
WHT-RED
METER J1-4
WHT-YEL
METER J1-5
WHT-GRN
L16 0.62 MH
C77 0.25 UF
C44 0.1UF
R24 820
R25 270
C45 0.1UF
R23 5.6K
C43 0.1 UF
R26 470
C46 0.1 UF
L15 0.62MH
R27 1K
C47 .01 UF
C75 0.2 UF
L14 0.62MH
C76 0.1UF
R28 18K
C49 .01 UF
C50 27
C74 0.2 UF
CR2
C73 0.2 UF
C48 820
-X
C54 0.1UF
C51 0.1 UF
R30 1.5K
R31 1K
R29 3.3K
C52 .01 UF
R32 1.5K
R35 3.9K
R36 1K
C55 0.1 UF
R34 12K
C53 820
R33 220
C56 .01UF
R37 1.5K
C57 27
C58 .01 UF
CR3
R38 18K
R39 3.3 K
C59 0.1 UF
R40 1.5K
R41 1K
R42 1.5K
R43 470
C60 0.2 UF
C61 .01 UF
R45 1K
R46 470
C63 0.2 UF
R47 220
C62 0.2 UF
R44 18K
R48 1K
R52 470
C70 0.2 UF
C66 1000 1300
C64 270
C65 800 390
T5
C72 .01UF
R53 150K 68K
R51 10K 4.7K
C71 3300
C69 .01UF
R49 150K
L12
R50 10K 4.7K
CR4
C68 2500
C67 82
CR5
L13 2MH
9.5V
9.2V
3.8V
3.2V
3.4V
6.4V
7.6V
7.5V
5.1V
3.8V
2.5V
5.7V
10.8V
12.0V
3.0V
BLK
TAN
GND
GRN-RED
Q10 M9003
Q11 M4590
Q12 M9003
Q13 M4590
Q14 M4605
BASE
EMITTER
COLLECTOR
TRANSISTOR DETAIL
SPLIT CHANNEL MODELS ONLY

INPUT
FROM 455KC FILTER

SUFFIX IDENTIFIER
TLN6480AS
TLN6480AW

NOTE:
13. RECEIVER COMPONENT VALUES ENCLOSED IN OVALS ARE WIDE CHANNEL VALUES.

OUTPUT
TO CONTROL HEAD VIA AUDIO & SQUELCH BOARD

DEPD-6373-D

DEPD-7609-O

455 KC IF Circuit Board Detail
Model TLN6480AS & TLN6480AW used in
136-174 MC "Motrac" Receivers
Motorola No. EPD-7610-O

CEPD-6983-B

CEPD-6984-B

CEPD-6371-A

Use the following se
encountered.

1. **TEST EQUIPMENT REQUIR**

Motorola Model T10
Motorola Model S10
Adapter Cable r
Motorola Model TEK
UHF type T connect
Motorola Model T10
Motorola Model S10

2. **"EXTENDER" OPERATION**

To check for proper
with the r-f carrier sign
STD-REJECT switch is
the switch is in the EXT

a. Connect the uhf "T"

b. Connect the r-f sign

c. Place the EXTEND-

d. With the pulse gener
described in the Receive
(or uv).

e. Increase the r-f sig

f. Set the pulse genera
reduced back to 20 db qu

Place the EXTEND-
generator to again produ
within 10 db of the norma

No

20

g. To check for proper
pulse generator as desc
tion. While slowly incre
audio output. At one poi
point at which the automa
abling should occur betw

h. If the "Extender" o
SERVICING paragraph.

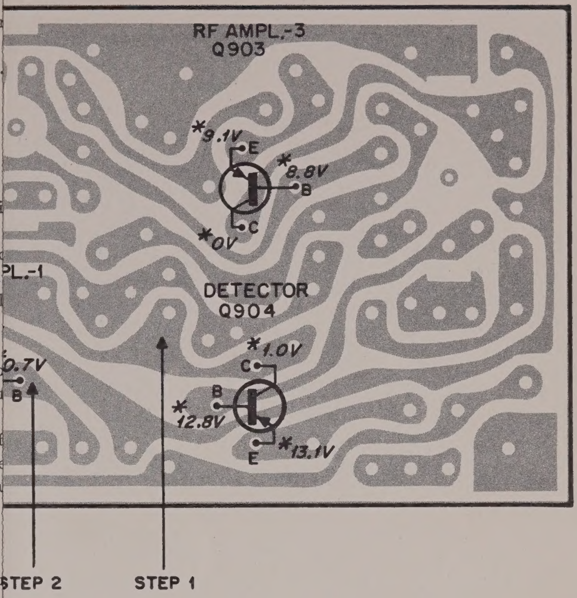
ollowing p
radio set.
r.
et.
he "sampli
THEORY
der these
r" circuit
l in the pul

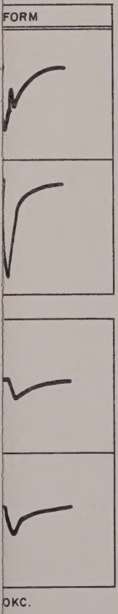
annot be ob
cedure Fo
stage d-c
late the de
tage. Refe
ent procedu

xtender" u
d pulse am
individual
or schem
to indicate

onnect the

D position.





"Extender" Servicing Procedure
Motorola No. EPD-6982-A

PARTS LIST

TLN6480AS 455 KC IF Board (30 KC)
TLN6480AW 455 KC IF Board (60 KC) EPD-7610-O

REFERENCE SYMBOL	MOTOROLA PART NO.	DESCRIPTION
		CAPACITOR, fixed: uuf; 500 v; unl. stated
C43, 44, 45, 46, 51, 54, 55, 59, 76	21C82372C01	0. 1 uf +80-20%; 25 v
C47, 52, 58, 61	21C82428B03	.01 uf +70-30%; 100 v; X5V9
C48	21C82187B17	820 ±10%
C49, 69, 72	21D82428B12	.01 uf +70-30%; 100 v; X5U9
C50, 57	21R410089	27 ±10%; NP0
C53	21K837745	820 ±10%
C56	21D82428B02	.01 uf +70-30%; 100 v; X5U9
C60, 62, 63, 70, 73, 74, 75	21C82372C02	0.2 uf +80-20%; 25 v
C64	21K859178	270 ±5%; 300 v 30 kc
C65	21K840049	800 ±5%; 300 v 30 kc
	or21K859945	390 ±5% 60 kc
C66	21K847601	1000 ±5% 30 kc
	or21K864736	1300 ±5% 60 kc
C67	21D82204B05	82 ±5%; N2200
C68	21K859773	2500 ±5%
C71	21C82187B05	3300 ±10%; 100 v
C77	8K834384	0. 25 uf ±20%; 200 v
		SEMICONDUCTOR DEVICE, diode: (SEE NOTE)
CR2, 3	48C82178A04	germanium
CR4, 5	48C855216	germanium
		COIL, discriminator:
L12	24B82619C02	455 kc; YEL; incl. 1K867236 CORE, tuning
L13	24V80900A74	choke: 2 mh; sleeved
L14, 15, 16	24V80900A61	choke: 0. 62 mh; sleeved
		TRANSISTOR, (SEE NOTE)
Q10, 12	48R869003	P-N-P; type M9003
Q11, 13	48R134590	N-P-N; type M4590
Q14	48R134605	P-N-P; type M4605
		RESISTOR, fixed: ±10%; 1/4 w; unl. stated
R23	6K129433	5. 6K
R24	6K129432	820
R25	6K129752	270
R26, 43, 46, 52	6K127801	470
R27, 31, 36, 41, 45, 48	6K127802	1K
R28, 38, 44	6K128904	18K
R29, 39	6K129231	3. 3K
R30, 32, 37, 40, 42	6K127803	1. 5K
R33, 47	6B127800	220
R34	6K129230	12K
R35	6K129232	3. 9K
R49	6K129146	150K
R50, 51	6K129668	10K ±5%; 30 kc
	or6K129669	4. 7K ±5%; 60 kc
R53	6K129146	150K 30 kc
	or6K129144	68K 60 kc
		TRANSFORMER, discriminator:
T5	24B82619C04	BLK; incl. 1K867236 CORE, tuning: 30 kc
	or24B82619C03	BLU; incl. 1K867236 CORE, tuning: 60 kc
NON-REFERENCED ITEMS		
	1V80715A58	455 kc Printed Circuit Board
	26B82679C01	SHIELD, coil: used on L12 & T5

NOTE:
Replacement transistors and diodes must be ordered by Motorola part number only for optimum performance.

CEPD-6983-B

CEPD-6984-B

CEPD-6371-A

"EXTENDER" SERVICING AIDS

Use the following servicing information if improper operation of the "Extender" circuitry is encountered.

1. TEST EQUIPMENT REQUIRED (or equivalent)

Motorola Model T1034B FM Signal Generator
Motorola Model S1056A-9A or TU546 Series Portable Test Set (A Motorola Model TKN6025A
Adapter Cable must be used with the test set for "Motrac" receivers.)
Motorola Model TEK-21 Pulse Generator (no equivalent)
UHF type T connector and cable (supplied with TEK-21 Pulse Generator)
Motorola Model T1014B or T1015A Oscilloscope
Motorola Model S1052B or S1063A DC Multimeter

2. "EXTENDER" OPERATIONAL CHECK

To check for proper "Extender" operation, noise pulses must be coupled into the receiver along with the r-f carrier signal. These pulses will degrade the receiver sensitivity when the EXTEND-STD-REJECT switch is in the STD position. However, the noise pulses will have little effect when the switch is in the EXTEND position.

a. Connect the uhf "T" connector to the radio set antenna connector.

b. Connect the r-f signal generator and the pulse generator to the "T" connector.

c. Place the EXTEND-STD-REJECT switch in the STD position.

d. With the pulse generator OFF, adjust the r-f signal generator to produce 20 db quieting as described in the Receiver Alignment Procedure. Note the reading on the signal generator in dbm (or uv).

e. Increase the r-f signal generator output by 50 db above the 20 db quieting level obtained in step d.

f. Set the pulse generator in the HI position and adjust the LEVEL control until the quieting level is reduced back to 20 db quieting.

Example:

Normal 20 db quieting	-118 dbm (.27 microvolt)
20 db quieting degraded 50 db	-68 dbm (85 microvolts)

Place the EXTEND-STD-REJECT switch in the EXTEND position and re-adjust the r-f signal generator to again produce 20 db quieting. The 20 db quieting level obtained in this manner should be within 10 db of the normal 20 db quieting level.

Example:

Normal 20 db quieting	-118 dbm (.27 microvolt)
20 db quieting (Noise on - switch in EXTEND position)	-118 to -108 dbm (.27 to .89 microvolt)

g. To check for proper operation of the "Extender" automatic sensitivity control circuitry, leave the pulse generator as described in step f. Place the EXTEND-STD-REJECT switch in the EXTEND position. While slowly increasing the r-f signal generator input from 20 db quieting, listen to the receiver audio output. At one point, a definite increase in noise level will be heard in the speaker. This is the point at which the automatic sensitivity circuit has disabled the "Extender" channel. The point of disabling should occur between 100 and 500 microvolts of signal input.

h. If the "Extender" operation is not as described in this section, refer to the "EXTENDER" SERVICING paragraph.

3. "EXTENDER" SERVICING

a. "Extender" RF Section

To determine if the r-f stages are operating properly, use the following procedure.

(1) Connect a uhf "T" connector to the antenna connector on the radio set.

(2) Connect the signal generator to one end of the "T" connector.

(3) Connect the portable test set to the receiver metering socket.

(4) Set the signal generator for an output of 100 microvolts at the "sampling" frequency. To determine the proper "sampling" frequency, refer to the table in the THEORY OF OPERATION section. Set the test set to meter position 3. The meter reading under these conditions should read 4 to 6 microamperes. If a correct reading is obtained, the "Extender" circuitry up to the output of the third r-f amplifier is operating correctly and service is required in the pulse circuitry. Proceed to paragraph b.

(5) If a correct reading on position 3 as described in step (4) cannot be obtained, recheck the "Extender" channel alignment at outlined in Receiver Alignment Procedure For "Extender" Models. If a correct reading still cannot be obtained, check the individual r-f stage d-c voltages and compare them to the printed circuit board detail or schematic diagram to isolate the defective stage. RF stage gain measurements also may be taken to locate the defective stage. Refer to the AVERAGE STAGE MEASUREMENTS (located on the reverse side of the alignment procedure).

b. "Extender" Pulse Amplifier Section

(1) If the "Extender" r-f section checks out properly but the "Extender" unit fails to operate as described in the "Extender" operational check, the pulse detector and pulse amplifier circuitry must be checked. The procedure for servicing these circuits is to make individual stage d-c voltage measurements and compare them to the printed circuit board details or schematic diagram. This will locate the defective stage in most cases. If voltage checks fail to indicate the defective stage, waveforms can be viewed at various points in the circuit.

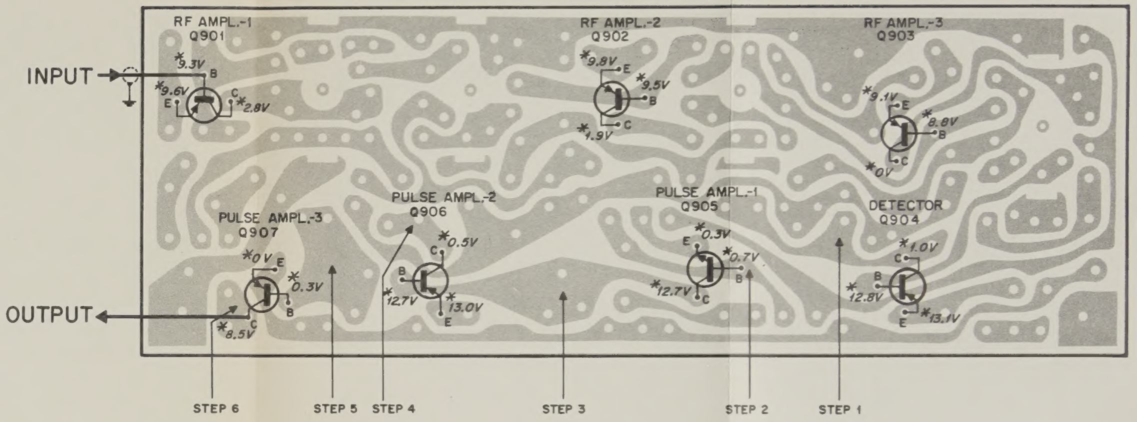
(2) To observe circuit waveforms:

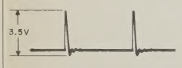
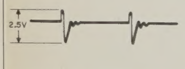
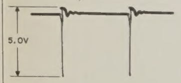
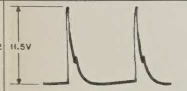
(a) Turn the signal generator output all the way down and connect the pulse generator to the other end of the "T" connector.

(b) Set the pulse generator to the HI position.

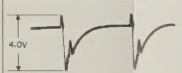
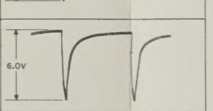
(c) Place the EXTEND-STD-REJECT switch in the EXTEND position and compare the waveform display with those shown in the waveform chart.

*VOLTAGES MEASURED WITH SWITCH IN EXTEND POSITION.

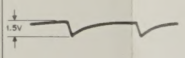
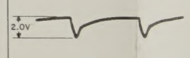


STEP	TEST POINT	PULSE WAVEFORM
1	Q904 DETECTOR COLLECTOR	
2	Q905 PULSE AMPL.-1 BASE	
3	Q906* PULSE AMPL.-2 BASE	
4	Q906 PULSE AMPL.-2 COLLECTOR	

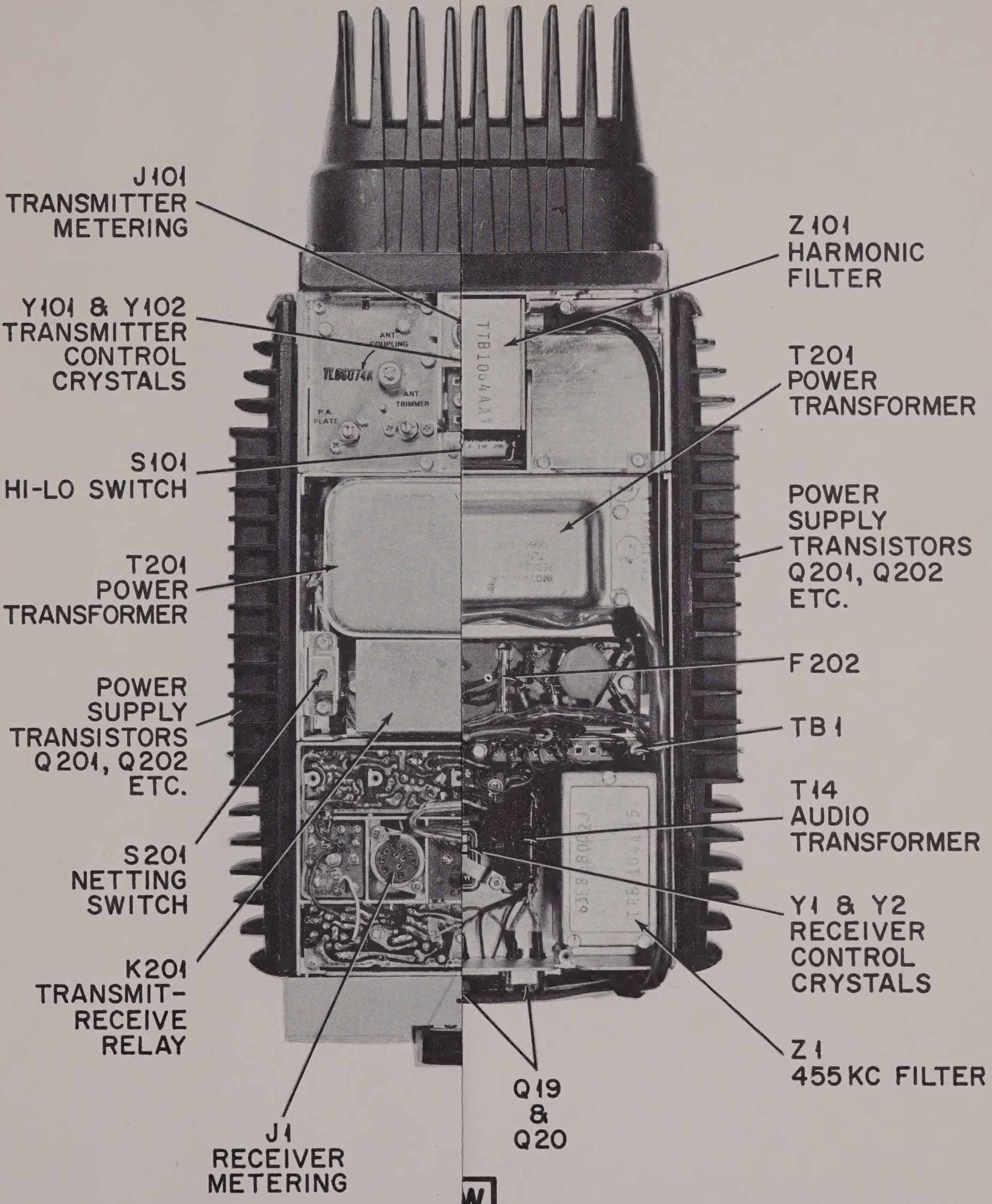
*ALSO Q905 COLLECTOR (SAME ELECTRICAL POINT)

STEP	TEST POINT	PULSE WAVEFORM
5	Q907 PULSE AMPL-3 BASE	
6	Q907 PULSE AMPL.-3 COLLECTOR	

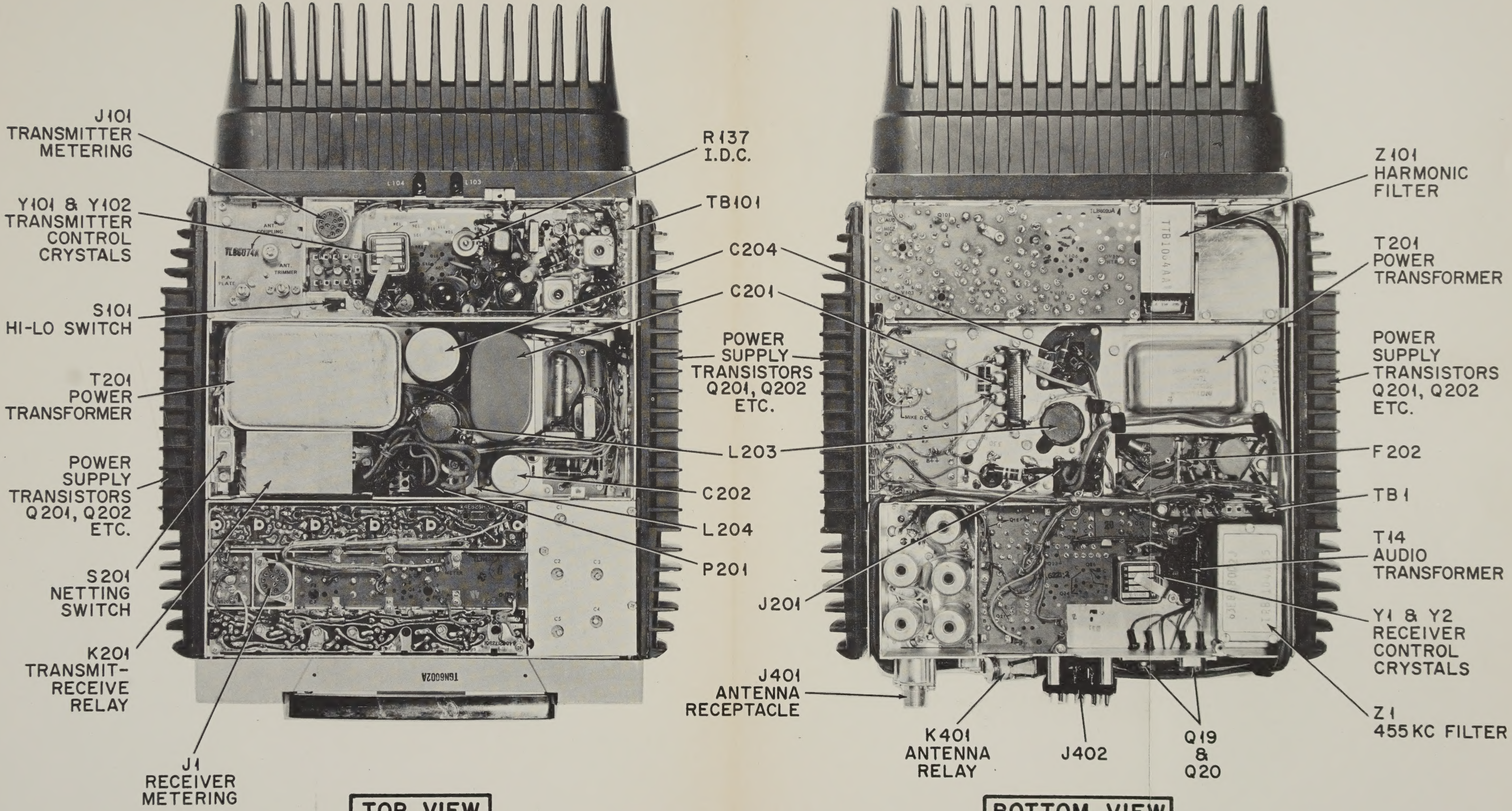
TEST POINTS ON R.F. DECK

7	Q802 RF AMPL.- 2 BASE	
8	Q802 RF AMPL.- 2 EMITTER	

REPETITION RATE OF ALL PULSES SHOWN IS 40KC.
(PULSE GENERATOR TEK-21 IN "HI" POSITION)


J101
TRANSMITTER
METERING
Y101 & Y102
TRANSMITTER
CONTROL
CRYSTALS
S101
HI-LO SWITCH
T201
POWER
TRANSFORMER
POWER
SUPPLY
TRANSISTORS
Q201, Q202
ETC.
S201
NETTING
SWITCH
K201
TRANSMIT-
RECEIVE
RELAY
J1
RECEIVER
METERING
Q19
&
Q20
Z101
HARMONIC
FILTER
T201
POWER
TRANSFORMER
POWER
SUPPLY
TRANSISTORS
Q201, Q202
ETC.
F202
TB1
T14
AUDIO
TRANSFORMER
Y1 & Y2
RECEIVER
CONTROL
CRYSTALS
Z1
455KC FILTER
ANT. COUPLING
ANT. TRIMMER
P.A. PLATE
TLD6074A
TTB1064AA

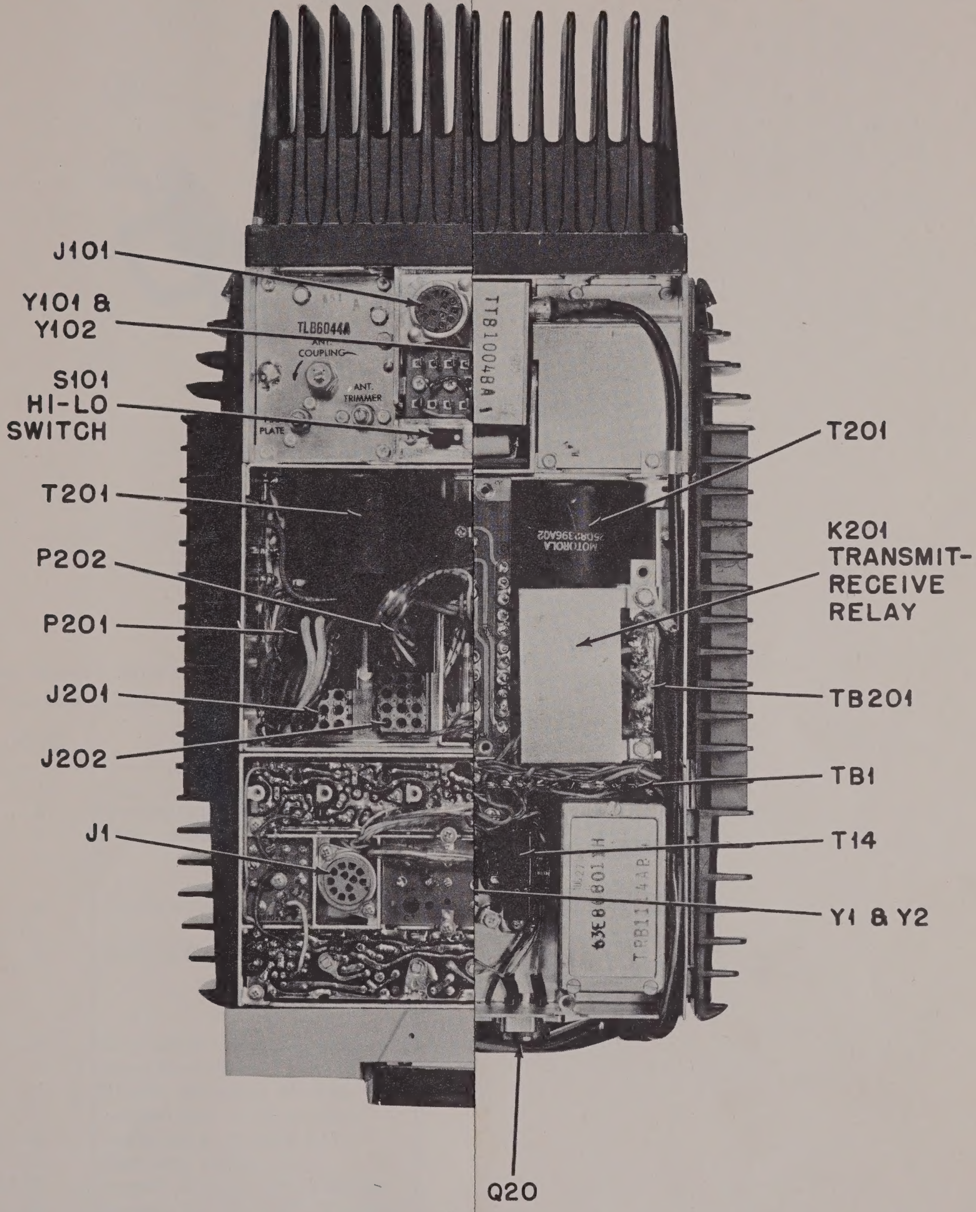
±12 V "Motrac" Radio Set
Miscellaneous Parts Location Detail
Motorola No. BEPD-6005-O


J101
TRANSMITTER
METERING
Y101 & Y102
TRANSMITTER
CONTROL
CRYSTALS
S101
HI-LO SWITCH
T201
POWER
TRANSFORMER
POWER
SUPPLY
TRANSISTORS
Q201, Q202
ETC.
S201
NETTING
SWITCH
K201
TRANSMIT-
RECEIVE
RELAY
J1
RECEIVER
METERING
R137
I.D.C.
TB101
C204
C201
POWER
SUPPLY
TRANSISTORS
Q201, Q202
ETC.
L203
C202
L204
P201
J201
J401
ANTENNA
RECEPTACLE
K401
ANTENNA
RELAY
J402
Q19
&
Q20
Z101
HARMONIC
FILTER
T201
POWER
TRANSFORMER
POWER
SUPPLY
TRANSISTORS
Q201, Q202
ETC.
F202
TB1
T14
AUDIO
TRANSFORMER
Y1 & Y2
RECEIVER
CONTROL
CRYSTALS
Z1
455KC FILTER

TOP VIEW

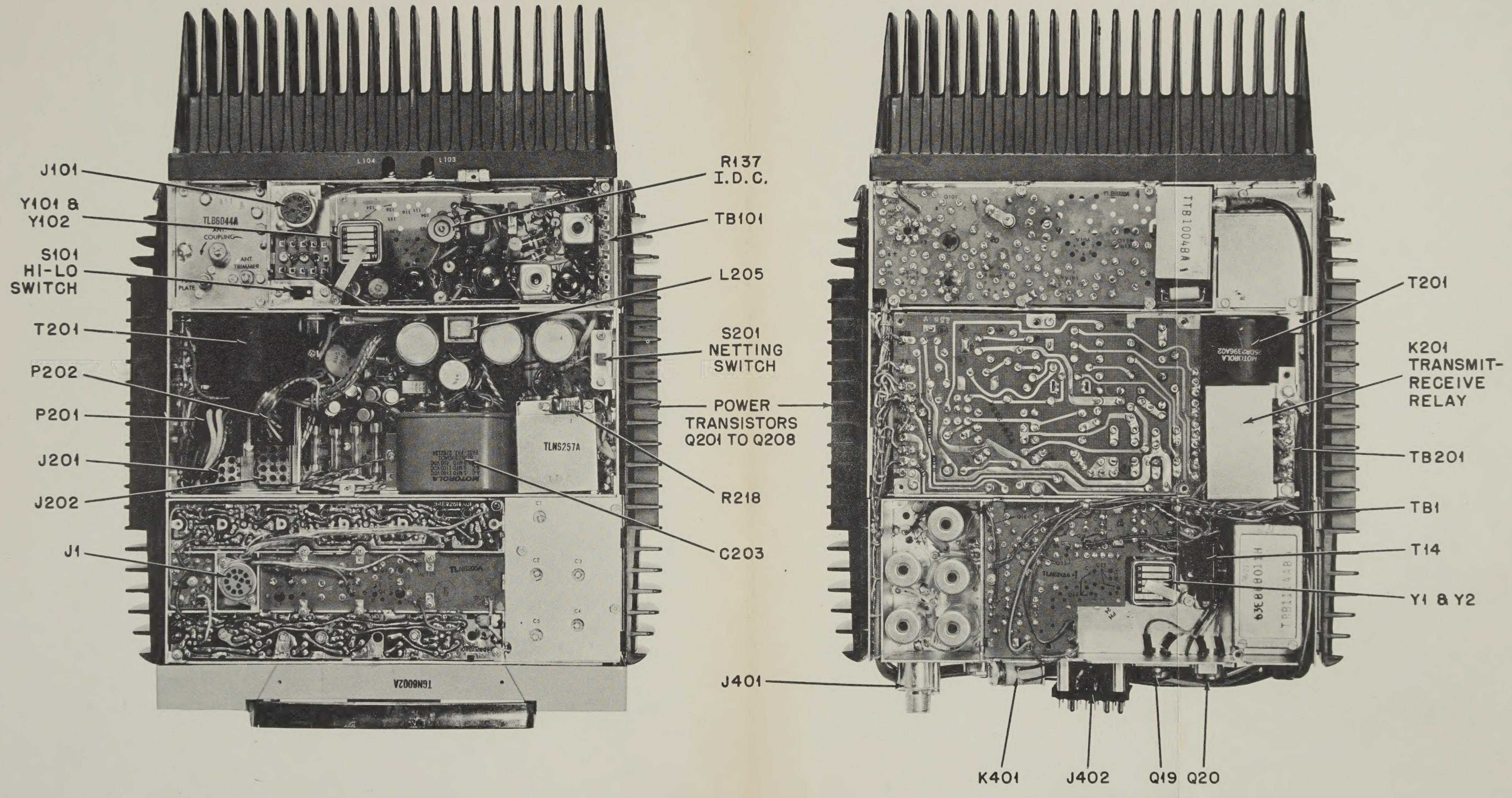
BOTTOM VIEW

±12 V "Motrac" Radio Set
Miscellaneous Parts Location Detail
Motorola No. BEPD-6005-O


J101
Y101 &
Y102
S101
HI-LO
SWITCH
T201
P202
P201
J201
J202
J1
T201
K201
TRANSMIT-
RECEIVE
RELAY
TB201
TB1
T14
Y1 & Y2
Q20
TLB6044A
ANT. COUPLING
ANT. TRIMMER
PLATE
TTB1004BA

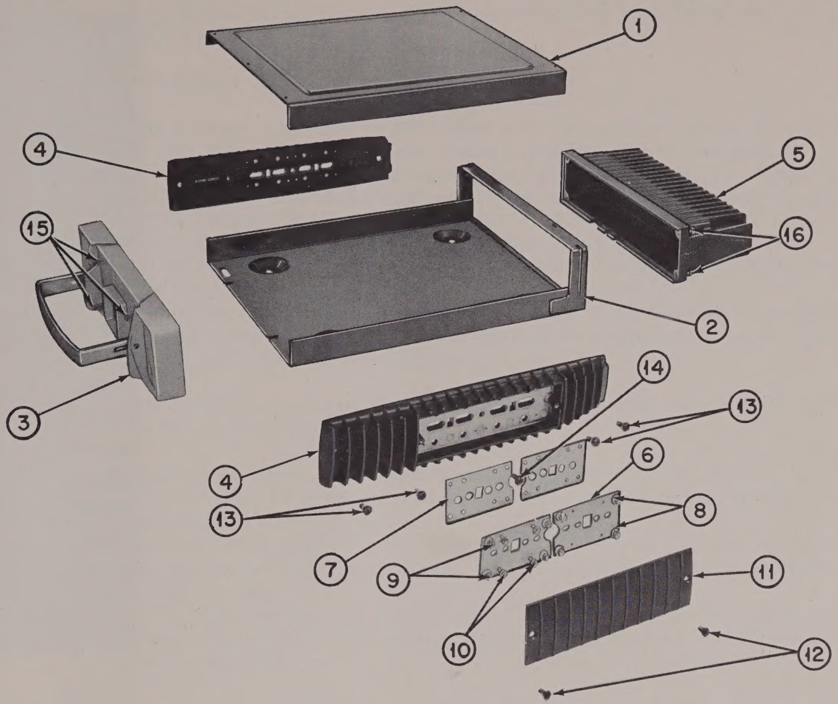
W

±6/12 V "Motrac" Radio Set
Miscellaneous Parts Location Detail
Motorola No. BEPD-6007-O


J101
Y101 &
Y102
S101
HI-LO
SWITCH
T201
P202
P201
J201
J202
J1
R137
I.D.C.
TB101
L205
S201
NETTING
SWITCH
POWER
TRANSISTORS
Q201 TO Q208
R218
C203
J401
T201
K201
TRANSMIT-
RECEIVE
RELAY
TB201
TB1
T14
Y1 & Y2
K401
J402
Q19
Q20

BOTTOM VIEW

±6/12 V "Motrac" Radio Set
Miscellaneous Parts Location Detail
Motorola No. BEPD-6007-O



PARTS LIST (EPD-7285-A)

CODE	DESCRIPTION	PART NUMBER	APPLICATION
1	Top cover (housing)	15C852668	All models
2	(Bottom cover (housing)	15D852664	All models
3	Front panel	TGN6002A	All models except 6/12 "Extender" models
		or TGN6034A	For 6/12 volt "Extender" models
4	Power supply radiator	15D82215A01	For 25 w, 30 w, and 50 w models
		or 15D82215A03	For 60 w, 80 w, and 100 w models
5	Transmitter radiator	15B867111	For 30 w, and 50 w models
		or 15B865665	For 25 w models
		or 15K868761	For 100 w models
		or 15K868702	For 60 w and 80 w models
6	Transistor mounting plate	64A82344A01	All models
7	Mica insulator	14A82343A01	All models
8	Plastic shoulder washer	4A82345A01	All models
9	Lockscrew: 6-32 x 3/8"	3S131281	All models
10	Lockscrew: 6-32 x 5/16"	3S122318	All models
11	Heat sink cover	15D82215A05	All models
12	Screw: 6-32 x 3/8" "Phillips"	3S131440	All models
13	Screw: 10-32 x 1/2" "Phillips"	3S131269	All models
14	Screw: 10-32 x 5/8" "Phillips"	3S131270	All models
15	Screw: 6-32 x 7/8" "Phillips"	3S132401	All models
16	Screw: special purpose	3A857308	All models

Heat Sink and Housing Detail
Motorola No. EPD-7169-A

AEPD-5006-O (CE1777) AEPD-5375-O (MC6024) AEPD-2440-O

OSCILLATOR FREQUENCY ADJUSTMENT

oscillator "on-frequency" is the only oscillator adjustment necessary.
ollows:

d Method:

he frequency monitor as described in the frequency monitor instruction
. Place the monitor antenna within a few feet of the transmitter.
e selected channel crystal into the socket and set MON. CHANNEL
TOR to corresponding position. Follow standard monitoring procedure.
C101 for zero reading on the monitor CARRIER FREQUENCY meter
ing tool A). For two-frequency models adjust C144 also (F1-F2
in corresponding position). Tune transmitter to the highest used fre-
or most used frequency on two-frequency models.
etting the transmitter "on-frequency" remove the transmitter control
. The frequency monitor should indicate no transmitter output. Re-
rystal and proceed with alignment.

te Method: This method may be used only when the transmitter and
r frequencies are identical.

eceiver or check for proper receiver alignment by transmitting the
cy normally received to produce 0 ua reading on the discriminator
g (position 4 of test set).
etting switch located in the power supply. This will permit the trans-
to operate through the receiver. Zero ua should still be registered at
4 of test set.
r deviation occurs, adjust C101 for 0 ua reading. For two-frequency
tions, adjust C144 for 0 ua reading also (F1-F2 switch and transmitted
orresponding).

FINAL METER READINGS

smitter is aligned or tested, final meter readings should be made and entered

en in the table below are minimum except PA which is maximum. DO NOT ex-
iven for the PA current. This is the maximum plate current to which the unit
ed. Multiply the microampere scale reading by 5000 to obtain actual PA plate
mperes.
gh 6 are purely relative and do not give actual current or voltage measurement.

	-	-	-	Tripler Grid	Doubler Driver Grid	PA Grid	PA Plate Current	PA Plate Voltage	-
	1	2	3	4	5	6	7	9	10
30 W	-	-	-	3	4	11	27	22	-
50 W	-	-	-	3	4	18	26	35	-
100 W	-	-	-	3	4	20	48	37.5	-

ads same as position 1; do not use for power output.

AEPD-5006-O (CE1777)   AEPD-5375-O (MC6024)   AEPD-2440-O

TRANSMITTER PRE-ALIGNMENT NOTES

EXCERPTS FROM FCC REGULATIONS

FCC regulations state that:

1. Radio transmitters may be tuned or adjusted only by persons holding a 1st or 2nd class commercial radiotelephone operator's license or by personnel working under their immediate supervision.
2. The r-f power output of a radio transmitter shall be no more than that required for satisfactory technical operation considering the area to be covered and the local conditions.
3. Frequency and deviation of a transmitter must be checked before it is placed in service and rechecked once each year thereafter.

TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A or TU546 Series Portable Test Set with a Motorola Model TKN6025A Adapter Cable (available on separate order). A 0-50 microampere meter with 20, 000 ohms equivalent series resistance may be used if a test set is not available.
2. Motorola Model TLN6046A or TLN6376A Tuning Tool Kit.
3. Motorola Model P-7208 Wattmeter Dummy Load (P-7208 Wattmeter Dummy Load used for 30 & 50 w operation only) or RF wattmeter.
4. Motorola Model T1012A Power Supply (or equivalent).

HOW TO SET UP THE PORTABLE TEST SET

1. Set function selector switch to XMTR. position.
2. Place the oscillator and meter reversing switch in the OFF position.
3. Connect the 20-pin meter cable plug to the test set; connect the adapter cable to the cable coming from the test set; connect the other end of the adapter cable to the transmitter metering socket. When the test set is not being used, disconnect the 20-pin metering cable to conserve internal battery life. The plug on the cable acts as an on-off switch completing the battery circuit.

HOW TO KEY THE TRANSMITTER

Key the transmitter with the XMTR. ON switch on the test set or key and modulate the transmitter with a microphone plugged into the test set or radio set control head.

CAUTION

Do not key the transmitter for more than a few seconds at a time until it is properly tuned. Plate current is excessive in untuned stages and may cause damage. Turn on the transmitter for brief periods while reading the meter and making the adjustments.

CRYSTAL FREQUENCY CALCULATION

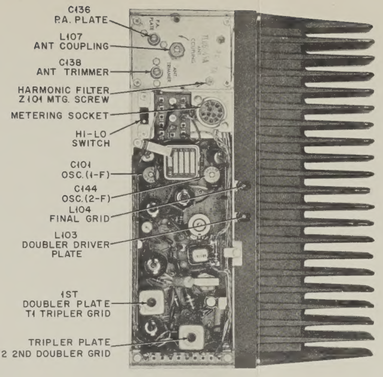
$$\text{xtal freq. in mc} \rightarrow f_o = \frac{f_c}{12} \leftarrow \underset{\text{(known)}}{\text{carrier freq. in mc}}$$

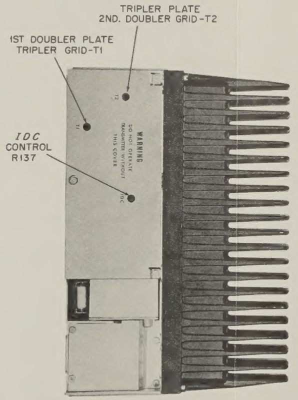
"IDC" CONTROL SETTING
(Transmitter Deviation)

Refer to the reverse side of the transmitter alignment chart for setting of the IDC control.

PRELIMINARY ADJUSTMENTS

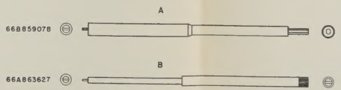
1. Connect the dummy load or r-f wattmeter to the front panel antenna receptacle.
2. Place the HI-LO switch on the transmitter in the LO position.
3. Turn the equipment on and allow at least 45 seconds for warm-up.





STEP	SWITCH POSITION	CIRCUIT METERED	STAGE AND TUNING PROCEDURE
1	---	---	Switch HI-LO power switch to LO power position. In LO power position white dot is not visible.
2	4	V103	1ST DOUBLER PLATE -- 1ST TRIPLER GRID. Use hex end of tuning tool A. Tune slugs of $\boxed{T1}$, bottom first, then top. Tune for peak meter reading. Repeak both slugs.
3	5	V104 Grid	1ST TRIPLER PLATE -- 2ND DOUBLER GRID. Same tool as in step 2. Tune slugs of $\boxed{T2}$, top first, then bottom. Tune for peak; then repeak.
4	6	V105 Grid	2ND DOUBLER PLATE -- PA GRID. Use slotted end of tool B. Tune driver plate (L103) for peak. Tune final grid (L104) for peak. Successively peak driver plate and final grid until a maximum is obtained.
5	7	V105 Plate	PA PLATE. Decouple by turning the COUPLING clockwise and adjust the ANT trimmer for minimum plate current reading on the test set meter. Adjust PA PLATE for minimum plate current reading on the test set meter.
6	---	---	Switch the HI-LO switch to the HI position. Repeat steps 4 and 5.
7	7	RF Output DO NOT EXCEED 140 MA for 30 Watt XMTR. DO NOT EXCEED 130 MA for 50 Watt XMTR. DO NOT EXCEED 240 MA for 100 Watt XMTR.	RF OUTPUT. Three methods can be used, wattmeter, field strength meter or loading into the antenna. Wattmeter method: Increase the COUPLING until the wattmeter shows an indication. Adjust the ANT trimmer for a maximum power output on the wattmeter. Dip the PA PLATE. Increase the COUPLING until rated power output is reached. Tune the ANT trimmer for a maximum. Re-dip the PA PLATE and adjust the COUPLING for maximum power output. PA CURRENT SHOULD NOT EXCEED values at left. Field Strength Meter method: Increase the COUPLING until the field strength meter shows an indication. Adjust the ANT trimmer for a maximum indication on the field strength meter. Dip the PA PLATE. Increase the COUPLING until a maximum meter indication is reached without exceeding current at left. Note that the maximum power output may be obtained without reaching maximum PA current. Loading into antenna method: Increase the COUPLING to obtain an increase in PA reading. Tune the ANT trimmer for a maximum PA current on the test set meter. Re-dip the PA current for a minimum reading. Increase the COUPLING until a meter indication approaching maximum PA current is reached. Re-tune the ANT trimmer for a maximum PA current as read on the test set meter. Re-tune the PA PLATE for minimum (this will be very slight). Adjust the COUPLING until the PA current is 140 ma or less, for 30 watt transmitters; 130 ma or less for 50 watt transmitters or 240 ma or less, for 100 watt transmitters. When loading into an antenna it is advisable to use a field strength meter to determine the power output. Maximum power output may be reached without reaching maximum plate current.
8	None	None	OSCILLATOR. FCC regulations require a periodic frequency check. If the check is due at this time follow the procedure at the right hand side of this sheet; OTHERWISE NO ADJUSTMENT SHOULD BE MADE.

TUNING TOOLS



OSCILLATOR FREQUENCY ADJUSTMENT

Setting the oscillator "on-frequency" is the only oscillator adjustment necessary. Do this as follows:

1. Standard Method:

   a. Set up the frequency monitor as described in the frequency monitor instruction manual. Place the monitor antenna within a few feet of the transmitter.
   b. Plug the selected channel crystal into the socket and set MON. CHANNEL SELECTOR to corresponding position. Follow standard monitoring procedure.
   c. Adjust C101 for zero reading on the monitor CARRIER FREQUENCY meter (use tuning tool A). For two-frequency models adjust C144 also (F1-F2 switch in corresponding position). Tune transmitter to the highest used frequency or most used frequency on two-frequency models.
   d. After setting the transmitter "on-frequency" remove the transmitter control crystal. The frequency monitor should indicate no transmitter output. Replace crystal and proceed with alignment.

2. Alternate Method: This method may be used only when the transmitter and receiver frequencies are identical.

   a. Align receiver or check for proper receiver alignment by transmitting the frequency normally received to produce 0 ua reading on the discriminator metering (position 4 of test set).
   b. Press netting switch located in the power supply. This will permit the transmitter to operate through the receiver. Zero ua should still be registered at position 4 of test set.
   c. If meter deviation occurs, adjust C101 for 0 ua reading. For two-frequency applications, adjust C144 for 0 ua reading also (F1-F2 switch and transmitted signal corresponding).

FINAL METER READINGS

1. Each time a transmitter is aligned or tested, final meter readings should be made and entered in a logbook.
2. All readings given in the table below are minimum except PA which is maximum. DO NOT exceed the value given for the PA current. This is the maximum plate current to which the unit can be safely tuned. Multiply the microampere scale reading by 5000 to obtain actual PA plate current in milliamperes.
3. Readings 1 through 6 are purely relative and do not give actual current or voltage measurement.

CIRCUIT METERED		-	-	-	Tripler Grid	Doubler Driver Grid	PA Grid	PA Plate Current	PA Plate Voltage	-
SWITCH POSITION*		1	2	3	4	5	6	7	9	10
METER READING	30 W	-	-	-	3	4	11	27	22	-
	50 W	-	-	-	3	4	18	26	35	-
	100 W	-	-	-	3	4	20	48	37.5	-

*PO position reads same as position 1; do not use for power output.

MEASUREMENT OF DEVIATION

te means of measuring transmitter deviation is to use the Motorola T1020A
and Deviation Meter. This unit, properly used, permits the accurate measure-
transmitter deviation from peak-reading meter, which is unaffected by waveform.
ot required with this instrument. With this device, the transmitter deviation can
tely even with voice modulation.

LINE LEVELS

n level in the system still appears to be too low after setting deviation as indicated
icrophone.

rocedure will insure that the transmitter will comply with FCC requirements for
.

of the correct deviation setting can not be overemphasized. Optimum system
ds accurate deviation setting, both from the standpoint that overdeviation will
ser on the adjacent channel, and underdeviation may reduce system range.

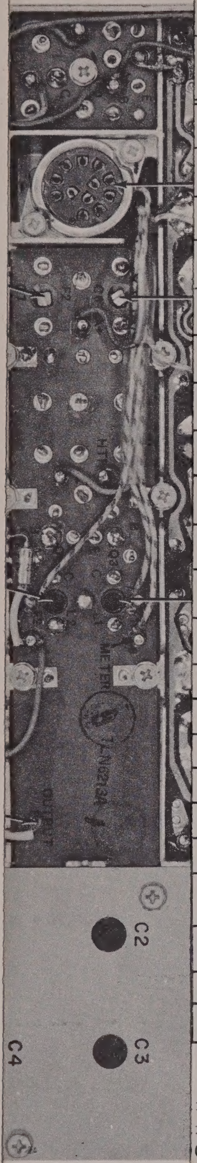
AEPD-4554-O (p/o CE1840)

AEPD-4555-O (p/o CE1840)

AEPD-4597-O (p/o CE1840)

OPERATION REFER TO PROCEDURE EPD-6392

STAGE MEASUREMENTS WITH RADIO SET PROPERLY ADJUSTED



INPUT TO		FREQUENCY	METER POSITION	TEST SET METER READING
Antenna Disconnected			1	0
Antenna Disconnected			2	15 ua
Antenna Disconnected			4	0
Antenna Disconnected			5	20 ua
Antenna Disconnected			6	16 ua
Antenna Connector		Carrier Freq.	20 DB Quieting (Par. E.)	
Antenna Connector		Carrier Freq.	1	10 ua
Base Collector	1st RF (Q1)	Carrier Freq.	1	10 ua
Base Collector	2nd RF (Q2)	Carrier Freq.	1	10 ua
Base 1st Mixer (Q6)		5.5 mc	20 DB Quieting (Par. E.)	
Base Collector	1st Mixer (Q6)	5.5 mc	1	10 ua
Base Collector	1st 5.5 mc IF (Q7)	5.5 mc	1	10 ua
Base Collector	2nd 5.5 mc IF (Q8)	5.5 mc	1	10 ua
Base of 2nd Mixer (Q9)		5.5 mc	1	10 ua
Output 2nd Mixer (Q9)		0.455 mc	1	10 ua
Base Collector	1st 455 kc IF (Q11)	0.455 mc	1	10 ua

STAGE MEASUREMENT NOTES

rements made with signal generator tuned to the required frequency.
rements, except antenna input, taken with a 50 ohm terminated cable
03 uf capacitor in series.

AEPD-6479-O (MC6923)

AEPD-2440-O

Receiver Alignment Procedure
Motorola No. EPD-6480-B

"IDC" ADJUSTMENT (PREFERRED METHOD USING OSCILLOSCOPE)

1. INTRODUCTION

Accuracy of test equipment is of prime importance to any user of radio communications equipment; but of equal importance is a knowledge of the characteristics of the measuring equipment under various conditions. The Motorola T1100A Series FM Station Monitor is the leader in the field with respect to sensitivity, accuracy under conditions of variation in r-f signal level, line voltage, and environmental conditions. In common with most other meters it has the characteristic of responding differently to different wave shapes. Therefore, the use of most present-day deviation meters can lead to confusion and errors in deviation setting, if the pitfalls are unknown or disregarded.

The ideal deviation indicator would be one which would respond instantaneously to the peak value of the modulation deviation regardless of waveform. The only device which meets all these requirements is an oscilloscope. It responds instantaneously and it shows the peak value of any waveform, no matter how complex. Properly calibrated, an oscilloscope is the most accurate and reliable instrument for measuring and setting transmitter deviation.

The oscilloscope must be used in conjunction with a receiver which has a stable discriminator characteristic, since the oscilloscope displays the demodulated signal. In addition to the oscilloscope and receiver, a means to accurately calibrate the system is required. The Motorola monitor fills these requirements, since it provides both a sensitive receiver with the proper discriminator characteristic and a reliable means of calibrating the oscilloscope. It has convenient terminals on the front panel for connection of the oscilloscope. Also, the Motorola FM Station monitor has two modulation meter scales, 0-20 kc for wide-band systems, and 0-10 kc for split-channel systems.

Split-channel conversion kits are available for modification of older models. When converted, the older models have convenient oscilloscope terminals and can be more accurate measurement devices for such systems.

2. TEST EQUIPMENT REQUIRED

a. Motorola T1100A Series FM Station Monitor (or equivalent)

b. Motorola Model S1051B, S1051BR, S1053A or S1053AR Transistorized AC Voltmeter (or equivalent)

c. Motorola Model TEK-1A Transistorized Tone Generator, 1000 cps (or equivalent)

d. Motorola Model T1014B Precision Wide Band Oscilloscope or Motorola Model T1015A General Purpose Oscilloscope (or equivalent)

e. Motorola Model S1056A-9A or TU546 Series Portable Test Set with a Motorola Model TKN6025A Adapter Cable (required for "Private-Line" models only)

3. OSCILLOSCOPE CALIBRATION

The first step in the measurement of transmitter deviation is to calibrate the oscilloscope. This can be done by using the transmitter which is to be measured.

Proceed as follows:

a. Remove the "Vibrasender" resonant reed in dual squelch "Private-Line" models.

b. Connect the oscilloscope to the monitor oscilloscope terminals and set up the monitor controls in accordance with the monitor instruction manual.

c. Turn the IDC control on the transmitter chassis to the full clockwise position.

d. Feed a 1000 cps test tone into the transmitter audio input (at mike receptacle). Modulate the transmitter with this tone so adjusted that the deviation as read on the FM monitor deviation meter is 2 kc (6 kc in a wide-band system). An audio oscillator must be used for generation of this tone, since a sinusoidal waveform is very important. The Motorola TEK-1A Transistorized Tone Generator is excellent for this purpose.

e. Adjust the vertical gain of the oscilloscope so that the total recovered audio pattern occupies some convenient height, e.g., four small squares (12 squares in a wide-band system). The split-channel condition is shown in figure 1.

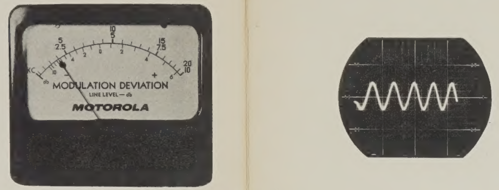


Figure 1.
Oscilloscope Calibration for Split-Channel Transmitter

Having calibrated the oscilloscope, there is no further need for the modulation deviation meter. Ignore its reading from this point on. It has already performed its important function of calibrating the oscilloscope.

With the oscilloscope calibrated as indicated, a recovered signal which occupies 10 squares (peak-to-peak) is equivalent to ±5 kc deviation. For wide-band systems, a recovered signal occupying 30 squares (peak-to-peak) is equivalent to ±15 kc deviation.

4. MEASUREMENT AND SETTING OF TRANSMITTER DEVIATION

Once the oscilloscope has been calibrated the transmitter deviation can be properly adjusted by the following method.

a. Carrier Squelch Models

(1) Adjust the 1000 cps input signal to 1 volt. This should drive the IDC circuit to the full clip. See figure 2.

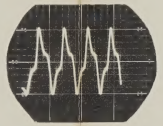


Figure 2.
5 KC Peak Deviation as seen on the Oscilloscope
(NOTE: Waveform is clipped fully)

(2) With this input signal level, adjust the IDC control on the transmitter to provide a 10-square peak-to-peak recovered signal on the oscilloscope. This is equivalent to ±5 kc deviation as shown in figure 2. A wide-band system should be adjusted for 30 squares (±15 kc).

(3) Reduce 1000 cps input to 0.25 volt. Essentially full deviation should still be observed on the oscilloscope. Less than full deviation may indicate a weak audio stage or other lack of audio gain.

b. Dual Squelch "Private-Line" Models

(1) Replace the "Vibrasender" resonant reed and check the "Private-Line" tone deviation. This may be read directly from the oscilloscope by pressing the transmitter push-to-talk switch on the test set. The tone deviation should be 0.5 to 1 kc.

> NOTE
>
> Due to a slight increase in discriminator response at the lower frequencies, the oscilloscope will read high, thus, an indication of 1.4 to 2.8 squares (peak-to-peak) is equivalent to 0.5 to 1 kc. This slight variation is only important when checking tone deviation. When setting maximum transmitter deviation as described below, it may be ignored.

(2) Adjust the 1000 cps input signal level for 1 volt and note the resultant combined deviation of the 1000 cps modulation and tone signal modulation on the oscilloscope.

(3) Adjust the IDC control on the transmitter for a peak-to-peak combined signal of 10 squares, equivalent to full 5 kc as shown in figure 3.

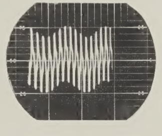


Figure 3.
5 kc Peak Deviation for Combined PL Tone and 1000 cps Modulation
(NOTE: PL Tone Superimposed on 1000 cps tone)

(4) Reduce the 1000 cps input to 0.25 volt. Essentially full combined 1000 cps tone and "Private-Line" tone deviation should still be observed on the oscilloscope. Less than full combined deviation may indicate a defective audio stage.

5. EMERGENCY MEASUREMENT OF DEVIATION

If an audio oscillator is not available, a loud sustained whistle of approximately 1000 cycles can be used for a rough measurement of deviation. If this rough check indicates the need for resetting deviation, do so only under controlled conditions, using a 1000 cps tone as previously indicated. The calibration of the oscilloscope should always be performed with a steady controlled signal. Do not attempt to calibrate the oscilloscope with a sustained whistle as waveform distortion will prevent an accurate calibration.

6. OTHER MEANS FOR MEASUREMENT OF DEVIATION

Another accurate means of measuring transmitter deviation is to use the Motorola T1020A Portable Frequency and Deviation Meter. This unit, properly used, permits the accurate measurement and setting of transmitter deviation from peak-reading meter, which is unaffected by waveform. An oscilloscope is not required with this instrument. With this device, the transmitter deviation can be measured accurately even with voice modulation.

7. MICROPHONE AND LINE LEVELS

If the modulation level in the system still appears to be too low after setting deviation as indicated above, check the microphone.

The foregoing procedure will insure that the transmitter will comply with FCC requirements for maximum deviation.

The importance of the correct deviation setting can not be overemphasized. Optimum system performance demands accurate deviation setting, both from the standpoint that overdeviation will interfere with the user on the adjacent channel, and underdeviation may reduce system range.

AEPD-4554-O (p/o CE1840) AEPD-4555-O (p/o CE1840) AEPD-4597-O (p/o CE1840)

IDC Adjustment Procedure
Motorola No. EPD-6478-B

AEPD-6479-O (MC6923)

AEPD-2440-O

FOR RECEIVERS WITH "EXTENDER" OPERATION REFER TO PROCEDURE EPD-6392

A. TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A or TU546 Series Portable Test Set with a Motorola Model TKN6025A Adapter Cable (available on separate order). A 0-50 microampere meter with 20,000 ohms equivalent series resistance may be used if a test set is not available.
2. Motorola Model T1034B Signal Generator (or equivalent).
3. Motorola Model TLN6046A Tuning Tool Kit. A small screwdriver may be used for some of the alignment.
4. Motorola Model T1012A Power Supply (or equivalent).

B. HOW TO SET UP THE PORTABLE TEST SET

1. Set function selector switch to RCVR position.
2. Switch on 455 kc crystal oscillator.
3. Connect 20-pin meter cable plug to test set; connect the adapter cable to the cable coming from the test set; connect the other end of the adapter cable to the receiver metering socket. When the test set is not in use, disconnect the 20-pin metering cable to conserve internal battery life. The plug on the cable acts as an on-off switch completing the battery circuit.
4. Connect the r-f extension cable to the test set; connect the r-f probe cable to the r-f extension cable.

C. HOW TO SET UP THE SIGNAL GENERATOR FOR 5.5 MC IF ALIGNMENT

1. Set up the signal generator according to the instructions supplied with the unit.
2. Connect the signal through a 0.003 microfarad capacitor to POINT 2 (first mixer) as shown on the photo. (Generator output cable terminated in 50 ohms.)
3. Switch the test set to meter position 4.
4. Rotate the signal generator dial back and forth near the 5.5 mc reading. Watch the test set meter. The pointer should swing above and below the zero reading as the dial is rotated. Set the dial to absolute zero meter reading.

D. HOW TO SET UP SIGNAL GENERATOR FOR RF ALIGNMENT

1. Set up the signal generator according to the instructions supplied with the unit.
2. Connect the signal generator cable to POINT 3 (1st mixer) through a 0.003 microfarad capacitor in series with the signal generator cable (cable termined in 50 ohms). The r-f deck cover must be removed to gain access to this diode.
3. Turn the generator output up to maximum.
4. Keep the test set in position 4.
5. Rotate the signal generator dial back and forth near the assigned r-f carrier frequency. Watch the test set meter. The pointer should swing above and below the zero reading as the dial is rotated. Set the dial for exact zero meter reading. Be sure the generator frequency is kept at zero meter reading.

E. HOW TO MEASURE 20 DB QUIETING SENSITIVITY

Test Equipment Required

1. Motorola Model T1034B Signal Generator
2. Motorola Model S1056A-9A or TU546 Series Portable Test Set

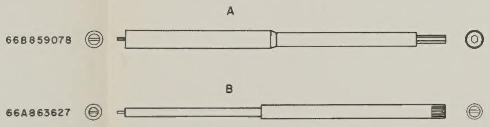
Procedure

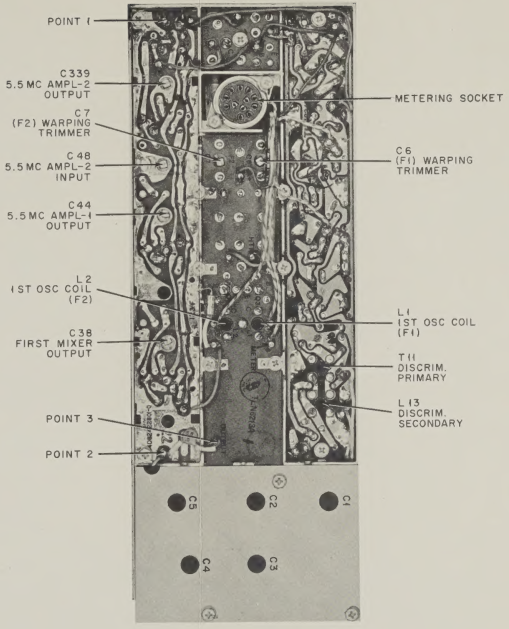
1. Turn on the signal generator and allow it to warm up for at least one hour.
2. Connect the meter cable from the test set to the receiver METER receptacle on the chassis.
3. Set the RCVR-XMTR-ACCESS switch to the RCVR position. Set the position selector to position 4.
4. Connect the signal generator output through a 6 db pad to the ANT jack on the radio set.
5. Turn up the generator output and rotate the generator dial back and forth near the assigned r-f carrier frequency. The test set meter pointer should swing above and below the zero mark as the generator dial is rotated. Set the dial for exact zero reading.
6. Reduce the signal generator output to zero (i.e., no signal input). Set the position selector switch to position 11 (AUDIO).
7. Unsquelch the receiver by turning the control head SQUELCH control fully counterclockwise.
8. Adjust the VOLUME control, located on the control head, for a 1.0 volt reading on the test set meter.
9. Now, turn up the signal generator output until the test set meter reading drops to 0.1 volt. Note the setting of the signal generator output control. This value in microvolts is the 20 db quieting sensitivity for the receiver.

F. TEST SET SELECTOR SWITCH POSITIONS

SWITCH POSITION	1	2	3	4	5	6	11
CIRCUIT METERED	455 KC IF Ampl. #1	455 KC IF Ampl. #3		Discrim. Secondary	Discrim. Primary	1st Osc.	Audio

TUNING TOOLS





G. RECEIVER ALIGNMENT

STEP	STAGE AND PROCEDURE
1	DISCRIMINATOR PRIMARY -- Set up the test set as described in paragraph B at the left. Insert a 2 uuf capacitor in series with the r-f probe. Place the r-f probe on the input to the 455 kc i-f filter (POINT 1). Adjust L13 so that the slug is very close to the top of the coil. Adjust T11 for a maximum indication on the test set meter in position 5. Use screwdriver end of tuning tool B.
2	DISCRIMINATOR SECONDARY -- Use the "0" center scale on the test set. Adjust L13 for absolute zero on the "0" center (top) scale with the switch in position 4. Use screwdriver end of tuning tool B. This is a critical adjustment and should be exactly on zero. Remove the r-f probe.
3	5.5 MC IF -- Set up the test equipment as described in paragraph C at the left. Use the minimum signal required for 5.5 mc alignment adjustments. Tune C339, C48, C44 and C38, in that order, for a maximum meter indication in position 1 or 2. Use any small screwdriver, or screwdriver end of tuning tool A.
4	FIRST OSCILLATOR -- Uncouple the signal generator. Position the trimmer, C6 (oscillator warping trimmer) so that the screwdriver adjustment slot is parallel with the length of the printed circuit board. Adjust oscillator coil L1 for a maximum meter indication in position 6. If 2-frequency, set F1-F2 switch on control head to F1 position while adjusting L1. Repeat in F2 position while adjusting trimmer coil L2. Use screwdriver end of tuning tool B. A frequency check must be made after adjustment of this oscillator. See step "5" for this procedure.
5	ON-FREQUENCY ADJUSTMENT -- Transmit a carrier from the transmitter which this receiver is normally intended to receive. If the "Motrac" transmitter and receiver are on the same frequency and if the transmitter is known to be "on-frequency", press the netting switch located on the power supply. This allows the transmitter to be heard in the receiver and an external transmitter is not required. Listen for quieting of noise at the test set speaker. Test set position 1 or 2 should indicate a rise when the transmitter is "on". Connect the antenna to the radio set antenna connector, if necessary. Check the meter indication in position 4; zero indicates "on-frequency". Set C6 for exact "0" center meter indication. On 2-frequency receivers, adjust C7 for the second frequency. DO NOT RE-ADJUST L1 or L2.
6	RF DECK -- Remove the 0.003 microfarad capacitor and connect the signal generator to the antenna input to the radio set. Tune C5, C4, C3, C2 and C1, in that order, for a maximum meter indication in position 1 or 2. Switch the test set to position 4 to check that the signal generator is still on exact "0" center. Use screwdriver end of tuning tool A.

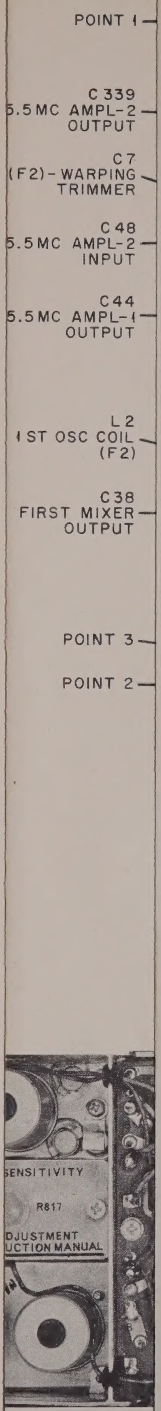
H. AVERAGE STAGE MEASUREMENTS WITH RADIO SET PROPERLY ADJUSTED

APPROXIMATE MICROVOLT INPUT	INPUT TO		FREQUENCY	METER POSITION	TEST SET METER READING
No Signal	Antenna Disconnected			1	0
No Signal	Antenna Disconnected			2	15 ua
No Signal	Antenna Disconnected			4	0
No Signal	Antenna Disconnected			5	20 ua
No Signal	Antenna Disconnected			6	16 ua
0.3	Antenna Connector		Carrier Freq.	20 DB Quieting (Par. E.)	
25	Antenna Connector		Carrier Freq.	1	10 ua
55	Base	1st RF (Q1)	Carrier Freq.	1	10 ua
5500	Collector				
175	Base	2nd RF (Q2)	Carrier Freq.	1	10 ua
12500	Collector				
1.5	Base 1st Mixer (Q6)		5.5 mc	20 DB Quieting (Par. E.)	
200	Base	1st Mixer (Q6)	5.5 mc	1	10 ua
1000	Collector				
750	Base	1st 5.5 mc IF (Q7)	5.5 mc	1	10 ua
5000	Collector				
3000	Base	2nd 5.5 mc IF (Q8)	5.5 mc	1	10 ua
50000	Collector				
30000	Base of 2nd Mixer (Q9)		5.5 mc	1	10 ua
400000	Output 2nd Mixer (Q9)		0.455 mc	1	10 ua
15000	Base	1st 455 kc IF (Q11)	0.455 mc	1	10 ua
2000000	Collector				

STAGE MEASUREMENT NOTES

1. All measurements made with signal generator tuned to the required frequency.
2. All measurements, except antenna input, taken with a 50 ohm terminated cable with a 0.003 uf capacitor in series.

AEPD-6389-O AEPD-6607-O (MC6921) AEPD-6606-O (MC6923)


POINT 1
C 339
5.5 MC AMPL-2
OUTPUT
C7
(F2)-WARPING
TRIMMER
C 48
5.5 MC AMPL-2
INPUT
C 44
5.5 MC AMPL-1
OUTPUT
L2
1 ST OSC COIL
(F2)
C38
FIRST MIXER
OUTPUT
POINT 3
POINT 2
SENSITIVITY
R817
DJUSTMENT
UCTION MANUAL

FOR RECEIVERS WITH "EXTENDER" OPERATION ONLY

CARRIER FREQ.	"SAMPLING" FREQ. FOR "EXTENDER" CHANNEL
25-25.5 MC	32.5 MC
25.5-26 MC	29 MC
26-28 MC	30 MC
28-30 MC	31 MC
30-31 MC	32 MC
31-36 MC	30 MC
36-38 MC	39 MC
38-40 MC	41 MC
40-42 MC	39 MC
42-48.5 MC	49.5 MC
48.5-50 MC	47.5 MC

NOTE

"Sampling" frequencies as listed in the table are suggested. However, in the event of interference the "Extender" channel can be tuned to a clear channel without any change in performance of the "radio" or "Extender" channels. Avoid tuning the "Extender" channel to the desired r-f carrier frequency or within 2 mc of the local oscillator frequency. A small degradation in receiver sensitivity will occur due to interaction of the two antenna coils when aligned to the r-f carrier frequency. The presence of strong signals from the local oscillator can desensitize the "Extender" channel when it is aligned within 2 mc of the local oscillator frequency.

CAUTION

Construction of the coils in the "Extender" circuit permits the slugs to pass through the coils. Therefore an alignment peak is present at either end of the coil. Align on the peak which places the slug nearest the bottom of the receiver. Adjust L814 from bottom side only to avoid detuning caused by insertion of metallic alignment tool.

H. AVERAGE STAGE MEASUREMENTS
ON REVERSE SIDE ➔

Receiver Alignment Procedure
For "Extender" Models
Motorola No. EPD-6392-C

AEPD-6389-O

AEPD-6607-O (MC6921)

AEPD-6606-O (MC6923)

A. TEST EQUIPMENT REQUIRED

1. Motorola Model S1056A-9A or TU546 Series Portable Test Set with a Motorola Model TKN6025A Adapter Cable (available on separate order). A 0-50 microampere meter with 20,000 ohms equivalent series resistance may be used if a test set is not available.
2. Motorola Model T1034B Signal Generator (or equivalent).
3. Motorola Model TLN6376A Tuning Tool Kit. A small screwdriver may be used for some of the alignment.
4. Motorola Model T1012A Power Supply (or equivalent).

B. HOW TO SET UP THE PORTABLE TEST SET

1. Set function selector switch to RCVR position.
2. Switch on 455 kc crystal oscillator.
3. Connect 20-pin meter cable plug to test set; connect the adapter cable to the cable coming from the test set; connect the other end of the adapter cable to the receiver metering socket. When the test set is not in use, disconnect the 20-pin metering cable to conserve internal battery life. The plug on the cable acts as an on-off switch completing the battery circuit.
4. Connect the r-f extension cable to the test set; connect the r-f probe cable to the r-f extension cable.

C. HOW TO SET UP THE SIGNAL GENERATOR FOR 5.5 MC IF ALIGNMENT

1. Set up the signal generator according to the instructions supplied with the unit.
2. Connect the signal through a 0.003 microfarad capacitor to POINT 2 (first mixer) as shown on the photo. (Generator output cable terminated in 50 ohms.)
3. Switch the test set to meter position 4.
4. Rotate the signal generator dial back and forth near the 5.5 mc reading. Watch the test set meter. The pointer should swing above and below the zero reading as the dial is rotated. Set the dial to absolute zero meter reading.

D. HOW TO SET UP SIGNAL GENERATOR FOR RF ALIGNMENT

1. Set up the signal generator according to the instructions supplied with the unit.
2. Connect the signal generator cable to POINT 3 (1st mixer) through a 0.003 microfarad capacitor in series with the signal generator cable (cable termined in 50 ohms). The r-f deck cover must be removed to gain access to this diode.
3. Turn the generator output up to maximum.
4. Keep the test set in position 4.
5. Rotate the signal generator dial back and forth near the assigned r-f carrier frequency. Watch the test set meter. The pointer should swing above and below the zero reading as the dial is rotated. Set the dial for exact zero meter reading. Be sure the generator frequency is kept at zero meter reading.

E. HOW TO MEASURE 20 DB QUIETING SENSITIVITY

Test Equipment Required

1. Motorola Model T1034B Signal Generator
2. Motorola Model S1056A-9A or TU546 Series

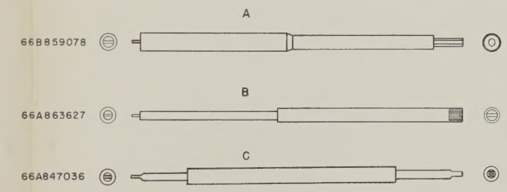
Procedure

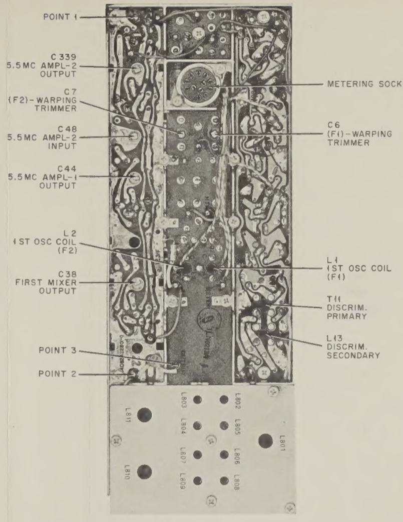
1. Turn on the signal generator and allow it to warm up for at least one hour.
2. Connect the meter cable from the test set to the receiver METER receptacle on the chassis.
3. Set the RCVR-XMTR-ACCESS switch to the RCVR position. Set the position selector to position 4.
4. Connect the signal generator output through a 6 db pad to the ANT jack on the radio set.
5. Turn up the generator output and rotate the generator dial back and forth near the assigned r-f carrier frequency. The test set meter pointer should swing above and below the zero mark as the generator dial is rotated. Set the dial for exact zero reading.
6. Reduce the signal generator output to zero (i.e., no signal input). Set the position selector switch to position 11 (AUDIO).
7. Unsquelch the receiver by turning the control head SQUELCH control fully counterclockwise.
8. Adjust the VOLUME control, located on the control head, for a 1.0 volt reading on the test set meter.
9. Now, turn up the signal generator output until the test set meter reading drops to 0.1 volt. Note the setting of the signal generator output control. This value in microvolts is the 20 db quieting sensitivity for the receiver.

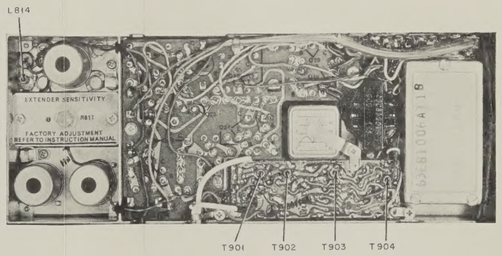
F. TEST SET SELECTOR SWITCH POSITIONS

SWITCH POSITION	1	2	3	4	5	6	11
CIRCUIT METERED	455 KC IF Ampl. #1	455 KC IF Ampl. #3	"Extender" RF Ampl. #3	Discrim. Secondary	Discrim. Primary	1st Osc.	Audio

TUNING TOOLS







G. RECEIVER ALIGNMENT

STEP	STAGE AND PROCEDURE
1	NOTE Set control head EXTEND-STD-REJECT switch to STD position for steps 1 thru 6. DISCRIMINATOR PRIMARY -- Set up the test set as described in paragraph B at the left. Insert a 2 uuf capacitor in series with the r-f probe. Place the r-f probe on the input to the 455 kc i-f filter (POINT 1). Adjust L13 so that the slug is very close to the top of the coil. Adjust T11 for a maximum indication on the test set meter in position 5. Use screwdriver end of tuning tool B.
2	DISCRIMINATOR SECONDARY -- Use the "0" center scale on the test set. Adjust L13 for absolute zero on the "0" center (top) scale with the switch in position 4. Use screwdriver end of tuning tool B. This is a critical adjustment and should be exactly on zero. Remove the r-f probe.
3	5.5 MC IF -- Set up the test equipment as described in paragraph C at the left. Use the minimum signal required for 5.5 mc alignment adjustments. Tune C339, C48, C44 and C38, in that order, for a maximum meter indication in position 1 or 2. Use any small screwdriver, or screwdriver end of tuning tool A.
4	FIRST OSCILLATOR -- Uncouple the signal generator. Position the trimmer, C6 (oscillator warping trimmer) so that the screwdriver adjustment slot is parallel with the length of the printed circuit board. Adjust oscillator coil L1 for a maximum meter indication in position 6. If 2-frequency, set F1-F2 switch on control head to F1 position while adjusting L1. Repeat in F2 position while adjusting trimmer coil L2. Use screwdriver end of tuning tool B. A frequency check must be made after adjustment of this oscillator. See step "5" for this procedure.
5	ON-FREQUENCY ADJUSTMENT -- Transmit a carrier from the transmitter which this receiver is normally intended to receive. If the "Motrac" transmitter and receiver are on the same frequency and if the transmitter is known to be "on-frequency", press the netting switch located on the power supply. This allows the transmitter to be heard in the receiver and an external transmitter is not required. Listen for quieting of noise at the test set speaker. Test set position 1 or 2 should indicate a rise when the transmitter is "on". Connect the antenna to the radio set antenna connector, if necessary. Check the meter indication in position 4; zero indicates "on-frequency". Set C6 for exact "0" center meter indication. On 2-frequency receivers, adjust C7 for the second frequency. DO NOT RE-ADJUST L1 or L2.
6	RF DECK -- Connect the signal generator to the antenna input on the radio set. Tune L801, L802, L803, L804, L805, L806, L807, L808, L809, L810 and L811 for a maximum meter reading on position 1. Continue to retune L802, L803, L804, L805, L806, L807, L808 and L809 until no further meter improvement is noted on position 1.
7	"EXTENDER" ALIGNMENT -- Place control head EXTEND-STD-REJECT switch in EXTEND position. Reset signal generator to "sampling" frequency as specified in table. Adjust T904, T903, T902, T901 and L814 in that order for maximum meter indication in test set position 3. Use screwdriver end of tuning tool C.
8	IMPORTANT This is a factory adjustment and should not require readjustment except after servicing the r-f circuit of the "Extender". "EXTENDER" GAIN -- With the "Extender" aligned, set the signal generator for a 100 microvolt output. Test set position 3 should indicate between 4 ua and 6 ua. If this reading is not obtained, adjust the "EXTENDER" SENSITIVITY control R817 (bottom side on RF Deck) for a meter reading of 5 ua on position 3.

FOR RECEIVERS WITH "EXTENDER" OPERATION ONLY

CARRIER FREQ.	"SAMPLING" FREQ. FOR "EXTENDER" CHANNEL
25-25.5 MC	32.5 MC
25.5-26 MC	29 MC
26-28 MC	30 MC
28-30 MC	31 MC
30-31 MC	32 MC
31-36 MC	30 MC
36-38 MC	39 MC
38-40 MC	41 MC
40-42 MC	39 MC
42-48.5 MC	49.5 MC
48.5-50 MC	47.5 MC

NOTE

"Sampling" frequencies as listed in the table are suggested. However, in the event of interference the "Extender" channel can be tuned to a clear channel without any change in performance of the "radio" or "Extender" channels. Avoid tuning the "Extender" channel to the desired r-f carrier frequency or within 2 mc of the local oscillator frequency. A small degradation in receiver sensitivity will occur due to interaction of the two antenna coils when aligned to the r-f carrier frequency. The presence of strong signals from the local oscillator can desensitize the "Extender" channel when it is aligned within 2 mc of the local oscillator frequency.

CAUTION

Construction of the coils in the "Extender" circuit permits the slugs to pass through the coils. Therefore an alignment peak is present at either end of the coil. Align on the peak which places the slug nearest the bottom of the receiver. Adjust L814 from bottom side only to avoid detuning caused by insertion of metallic alignment tool.

H. AVERAGE STAGE MEASUREMENTS
ON REVERSE SIDE →

Receiver Alignment Procedure
For "Extender" Models
Motorola No. EPD-6392-C

25-54 MC **"Motrac" FM Two-Way Radio** 68P81014A05-0